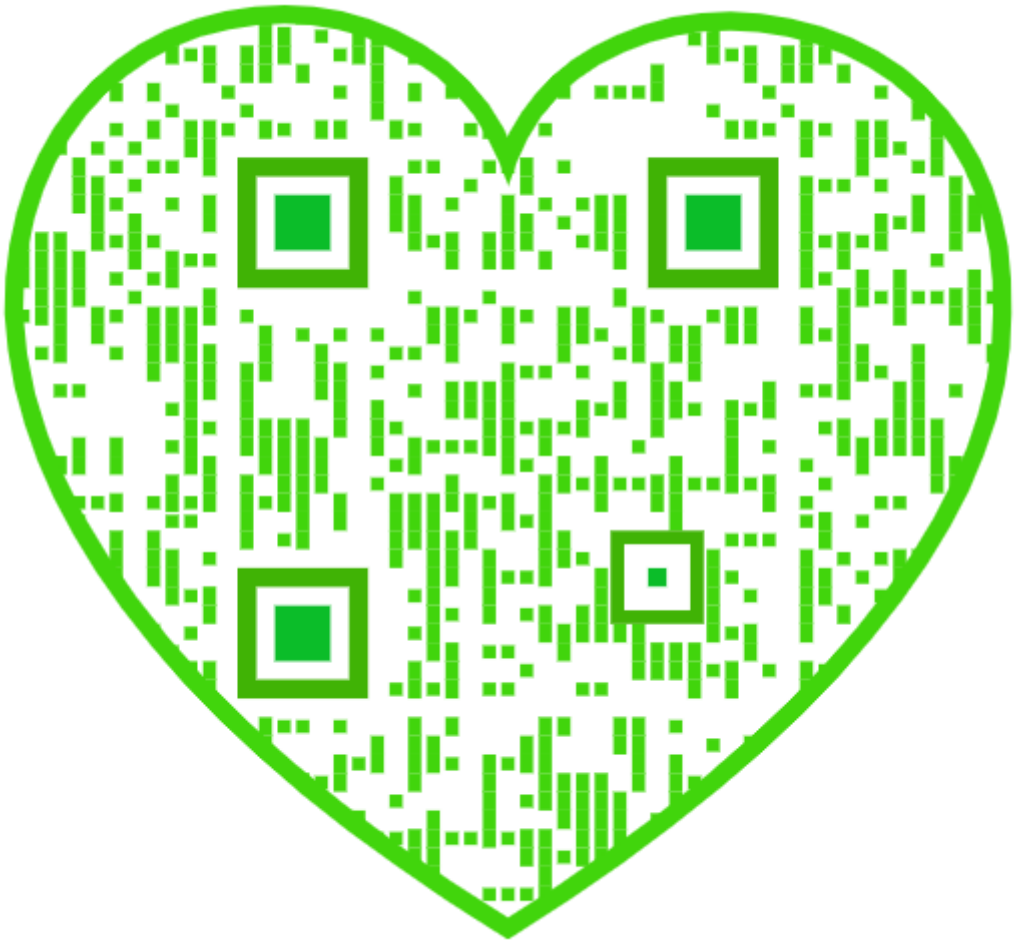

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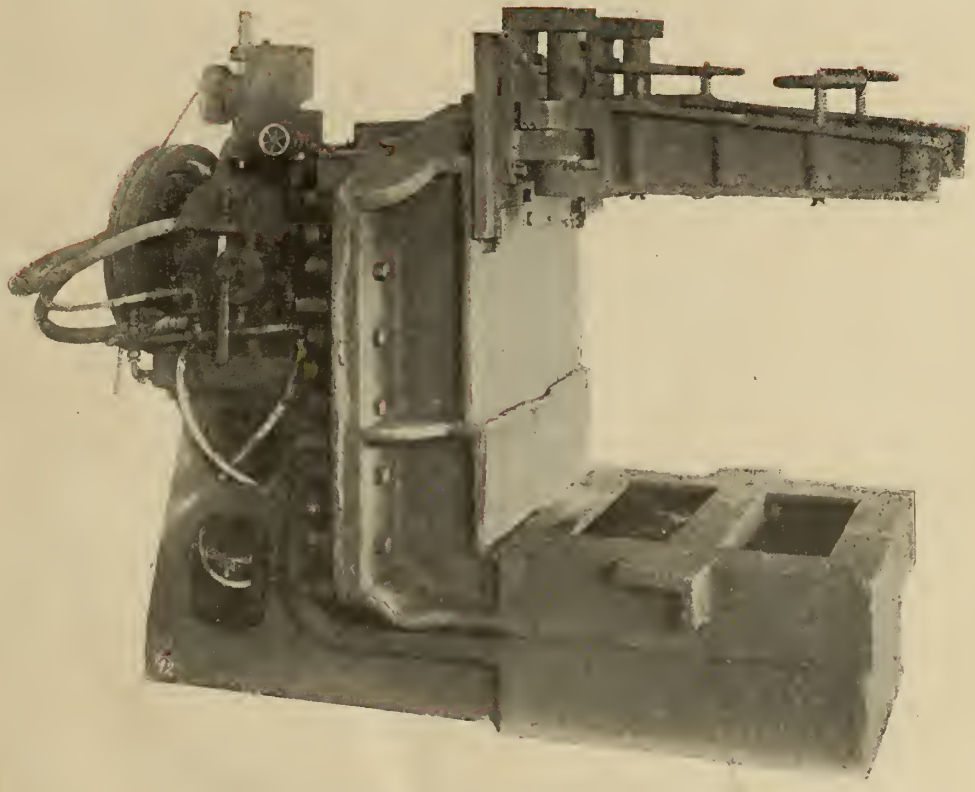
CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. XII. PUBLICATION OFFICE, TORONTO, JANUARY, 1921 No 1.

GRIMES ROLLOVER MOLDING MACHINES



MODEL K 1014, 2,500 lbs. LIFTING CAPACITY

Produce Better Castings for Less Money

We have solved some hard Molding Problems. Let us solve yours. Write us attention of "Bill"

GRIMES MOLDING MACHINE CO.

5738 Hastings St. - - - - - DETROIT, Mich.

Assures Best Cupola Results

Saves Material

Saves Labor

Solves Molding Troubles

Kawin Service

Reduces Losses—Increases Output

Resolved:

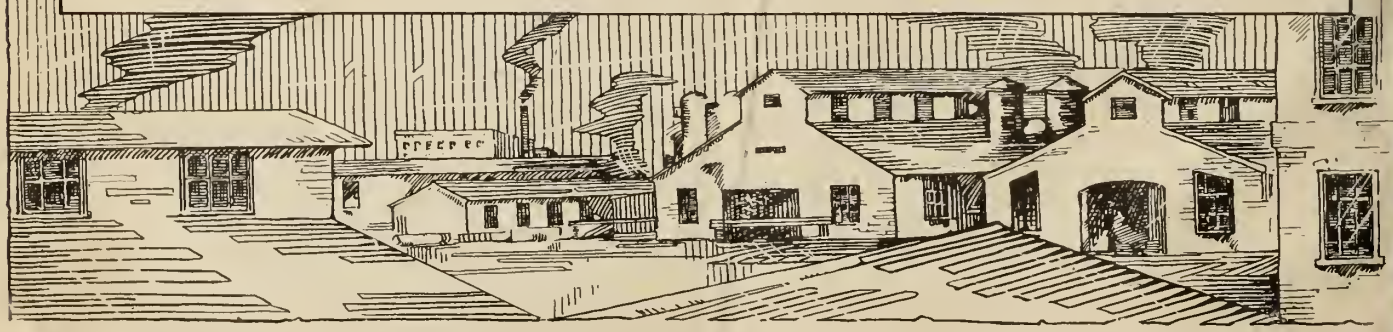
"TO start the New Year right by adopting Kawin Service; to put all cupola, mixing, molding and other foundry difficulties in the hands of these Practical Foundry Advisors who guarantee a 100 per cent. saving."

Charles C. Kawin Company

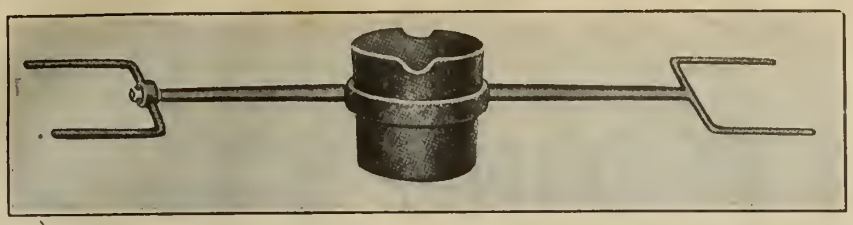
CHEMISTS, FOUNDRY ENGINEERS AND METALLURGISTS

307 KENT BUILDING, TORONTO

Buffalo, N.Y. Cincinnati, Ohio Chicago, Ill. San Francisco, Cal.



MADE IN CANADA



MADE IN CANADA

Flat Bottom, Steel Bowl, Bull Ladle with Double End, Swivel Shank.
Capacities 100 to 1,000 lbs. inclusive.

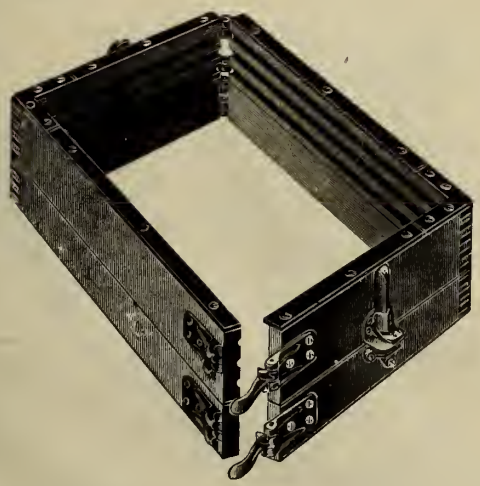
WOODISON

The Foundryman's *"Friend in Need"*

IT IS a fact worthy of note that many Canadian foundrymen, when they need New Equipment, instinctively turn to Woodison without investigating any further. Why? Because they know that **Woodison Foundry Equipment** is the most economical; that every Woodison Product is guaranteed to make good, and does make good under every working condition.

Woodison's Hardwood Snap Flasks

There is no danger of a Woodison flash springing and making a shift in your castings. They are made from materials best adapted to resist moisture and are strong and durable. Snaps are quick acting, hinges fit snugly and work easily. Standard sizes and shapes made up promptly to order. Write for partieulars.



WOODISON'S Heat Proof Cement

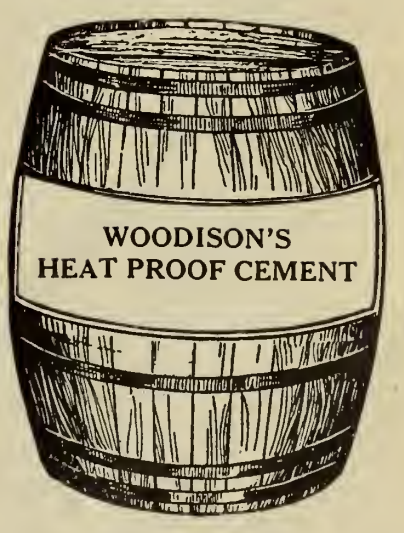
This plastic asbestos compound sets hard as a rock and is absolutely heat resisting.

Used extensively for:

Boiler Settings,
Bridge Walls,
Boiler Arches and
Fire Door Linings,
Annealing Furnaces,
Billet Heating Furnaces,
Case Hardening Furnaces,
Enamel Furnaces,
Brick Kilns,
Cement Kilns,
Forge Furnaces,
Heat Treating Furnaces.

Flat Bottom Welded Steel Bowls

These Bowls have heavy steel plate sides and head. Capacities 50, 100, 150, 200, 250, 300 and 350 lbs. or larger. When ordering ladle bowls, state inside diameter of shank ring that they are expected to fit.



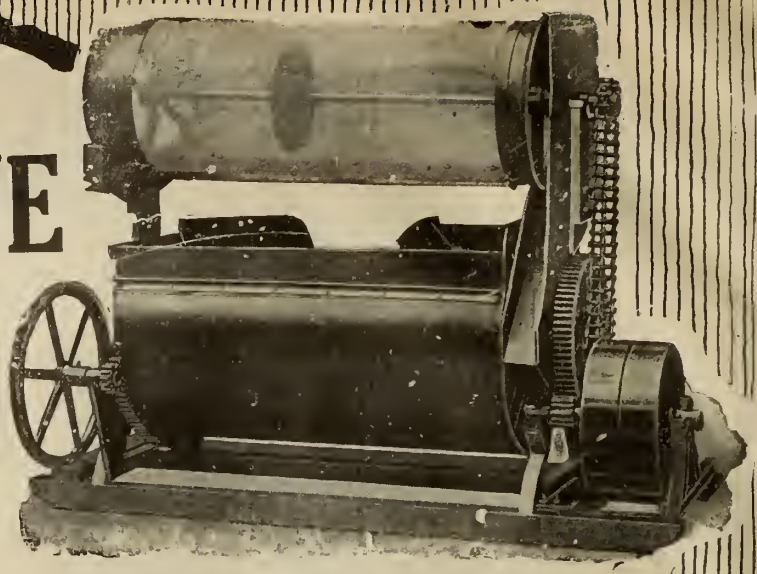
The E. J. Woodison Co., Limited

Fire Brick, Fire Clay and Foundry Requisites

Toronto **Ontario**

BLYSTONE

The Mixer That Shovels



Does the Work of Six Men

Can You Afford to be Without It?

The great feature of the Blystone Sand Mixer is that it **shovels** the sand, mixing it more thoroughly and evenly than is possible by hand and **in one-sixth the time!**

As the shovels revolve, the sand is shovelled over and over, and, with each revolution, **thrown** from one end of the drum to the other.

It has been repeatedly proven that the Blystone will accomplish more than six men working by the old, hand-shovelling method.

One man can mix core sand for twenty-five core makers and facing for one hundred molders—**and it takes less than half his time.** Does your experience show that six men, or even ten men with shovels could equal this?

Start and save the wages of these extra five men without delay.

Write for full particulars of our free trial offer.

BLYSTONE MANUFACTURING CO.

1120 Ironton St., Cambridge Spring, Pa.

Baltimore, J. W. Paxson Co.
Birmingham, Hill & Griffith Co.
Buffalo, E. J. Woodison Co.
Chicago, Scully Jones & Co.
Cincinnati, Hill & Griffith Co.
Cleveland, E. J. Woodison Co.
Detroit, E. J. Woodison Co.
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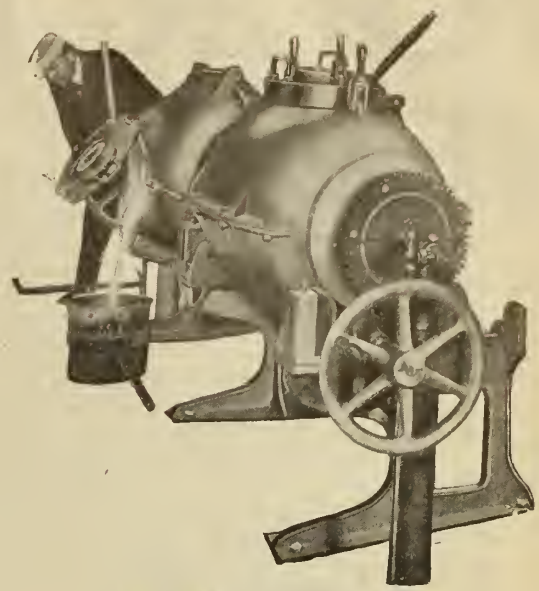
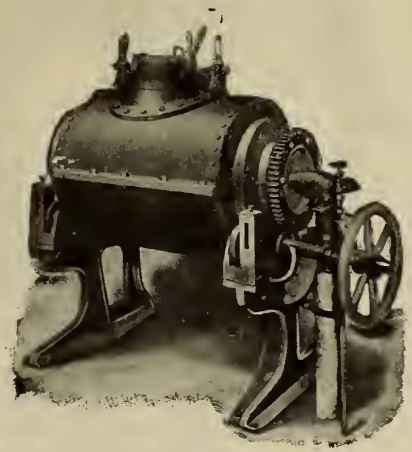
Philadelphia, J. W. Paxson Co.
Pittsburgh, J. S. McCormick Co.
San Francisco, Cal., Ditty Brothers.
Seattle, Wash., Ditty Brothers.

A BLYSTONE Would Save the Wages of Five of These Men

MONARCH MELTING FURNACES



Monarch Double Chamber Melting Furnace,



Monarch Rockwell Single Chamber Furnace "Simplex"—Oil or Gas.

Make Quicker, Cheaper Melts

It pays to make absolutely sure of the foundry equipment you buy. Compare the price of each article with its efficiency.

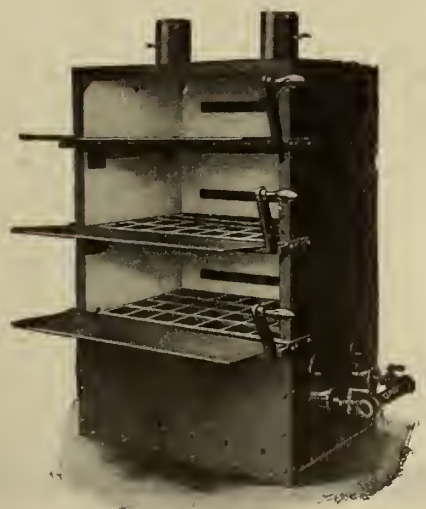
Without additional fuel Monarch Furnaces will melt two or three times as much metal in a given period as other furnaces. And, while not cheap, their cost is low.

Special attention is drawn to Monarch Double Chamber Furnaces. They burn oil or gas, require less space, less fuel, less attention, and do twice the work in half the time. They utilize all the heat from the one and only burner. While melting in one chamber the exhaust heat (something that other furnaces waste) is used to bring the metal in the other chamber to the melting point—or each chamber built independently.

The Monarch Double Chamber Furnace is 50 per cent. more economical than any other furnace. Write us for proof and we will tell you more about it.

Monarch Single Chamber "Simplex" Furnaces are built on the same lines as the double chamber furnace but without its continuous heating capacity. Best fuel economizer of its kind, oil or gas fuel.

Monarch "Arundel" Drop Front Core Ovens are hand made, of sheet steel, and are heavily lined with sheet asbestos. Made in any size up to 8 feet square.



Monarch "ARUNDEL" Drop Front Core Oven—Any Fuel

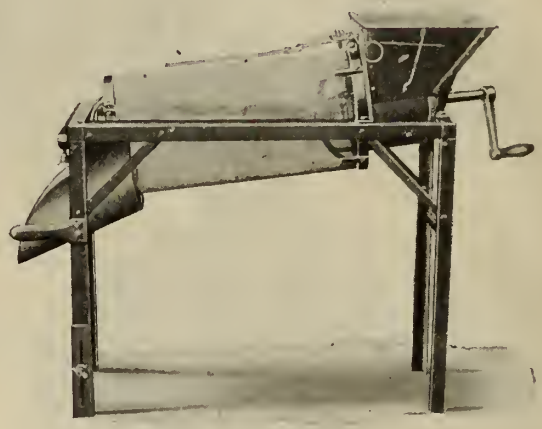
We would like to tell you more about Monarch lines. Write for our catalog.

The Monarch Engineering & Mfg. Company

1206 American Building, Baltimore, Md., U.S.A. **Shops: Curtis Bay**

YOUR FOUNDRY NEEDS THIS

The Grand Rotary Sand Riddle



Does the Work of Several Men

Write for Circulars, Prices, etc.

The Beyer Machine Company

Jackson, Michigan

U. S. A.

DOMINION OXYGEN
—*Growing with Canada*

THE Dominion Oxygen Company, Limited, is contributing a commodity and a service to Canadian industry. The Commodity is the highest grade of commercially pure oxygen. The Service is a growing chain of distributing stations that makes Dominion Oxygen always available in the quantity needed.

The first four distributing stations already in operation are the result of the Dominion Oxygen Company's first year of expansion. They are the measure of the success of the Company's efforts to give immediate and unfailing co-operation to gas users.

By placing within easy reach of every manufacturer in Canada an unlimited supply of the oxygen he needs for production and repair work—

By filling all orders for oxygen on the day they are received—

By using a cylinder light enough to make handling more economical, yet large enough to hold 220 feet of gas, and strong enough to pass the rigid requirements of the Railway Commission, and—

By adopting a liberal cylinder loan policy,

The Dominion Oxygen Company, Limited, feels that it is aiding materially in Canadian industrial expansion, and is justifying its program of additional plants and warehouses.

DOMINION OXYGEN COMPANY, *Limited*
Hillcrest Park, Toronto, Ontario
Hamilton Montreal Windsor

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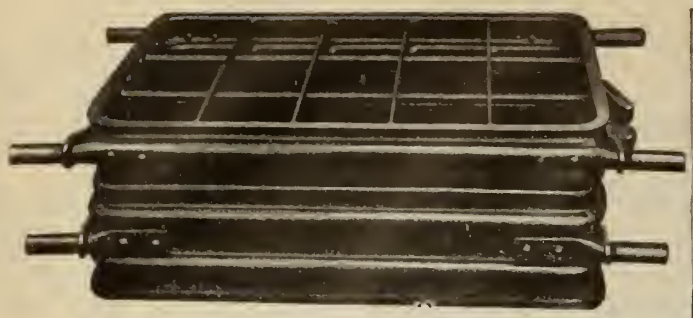


(Patent Applied For)

TRUSCON FLASK

Dimensions 16½-in. x 26-in.
Cope 6½-in. Drag 3½-in.

Pouring Truscon Flasks in Foundry of Allyne Ryan Foundry Co., Cleveland, Ohio.

Photo by courtesy Allyne Ryan Foundry Co.

DESIGNED FOR THE JOB—

Just as made to measure clothes better fit the man, so TRUSCON Flasks, designed for the job, better fit the job.

The advantages of TRUSCON designed-for-the-job Flasks not only keep the weight of the Flasks at a minimum, consistent with foundry usage, but also make possible a saving in the amount of sand required.

The weight of a TRUSCON Flask is often as much as forty per cent. less than a cast iron flask and the savings in the sand required range from ten to fifty pounds per casting, depending upon the size of the Flask.

Write for complete information and estimates.

Special Construction of Truscon Flasks

Truscon Flasks are formed of special Truscon Alloy Steel Plates. The deep ribs and broad flanges give to the steel shell exceptional strength and rigidity. Each rib and flange runs full depth around the corners and reinforces the steel to withstand all strains and stresses to which Flasks are liable on the foundry floor.

Truscon cross bars are formed from steel plates also. They are furnished bolted, welded or riveted to the walls of the Flask as desired.

TRUSCON STEEL CO. TRUSCON PRESSED STEEL

TRUSCON STEEL CO., YOUNGSTOWN, O.

Warehouses and Representatives in Principal Cities

TRUSCON FOUNDRY FLASKS

High-grade Bronzes for Engineering Purposes

CASTINGS
INGOTS
FORGINGS
RODS
ROLLS
SHAPES

"WRITE FOR COMPLETE CATALOG"

American Manganese Bronze Co.
Holmesburg, Phila., Pa.

PANGBORN
CORPORATION
HAGERSTOWN, MD
SAND-BLAST SPECIALISTS
P.O. Box 8508

$4,000.00 A YEAR
Saved in wages alone
Is the record in one plant
By the installation of a
"PANGBORN" SAND-BLAST
properly adapted to the work.

PANGBORN CORPORATION ALL WAYS SERVICE AND ALWAYS HAGERSTOWN, MD

A study of your work and conditions
To assure right equipment is the first step in
"PANGBORN" SERVICE

Pratt & Letchworth Malleable Foundry, Buffalo, N.Y.—210' x 520'—109,200 sq. ft. floor area.

This foundry is one of many commissions executed for the Pratt & Letchworth Co. by The Osborn Engineering Co. The building was erected over an existing foundry in which production was maintained during the entire period of construction.

THE OSBORN ENGINEERING COMPANY

2848 Prospect Ave. - - CLEVELAND, OHIO, U.S.A.

Efficiency is Economy

TABOR

10" POWER SQUEEZER

We have had 92 of these machines operating in one shop for over nine years, and the total cost of repair parts ordered has been less than $10.00 — a striking tribute to TABOR QUALITY.

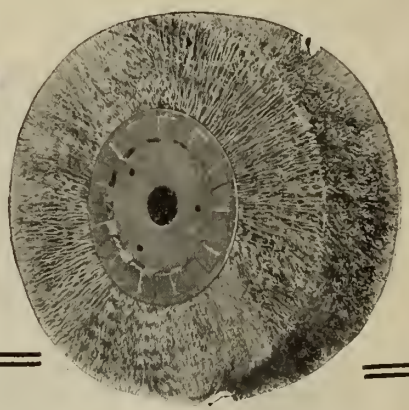
Send for Bulletin M.R.

There Is No Faster Machine Made

THE TABOR MANUFACTURING COMPANY, 6225 STATE ROAD, TACONY, PHILADELPHIA, U.S.A.

"SAMSON"

Wire Wheel Brush Sections



No Hub or Holder Required

For removing scales from hot forgings, axes, shovels and other tools; for cleaning brass castings, sheet brass and copper.

"Samson" Wire Wheel Brush Sections are made to be mounted with ease and quickness. The metal disc centre is punched to fit any size of spindle. Each section is a brush in itself, making a convenient and practical method of building a wheel any desired width of face.

A trial order will convince you that "Samson" scratch wheels are the most efficient and economical brushes you can secure. Write for catalog and full information.

The Manufacturers Brush Co., Cleveland, Ohio

111 Reade Street, New York

SIMPSON INTENSIVE FOUNDRY MIXER

Economical and Efficient for all kinds of Sand Mixtures

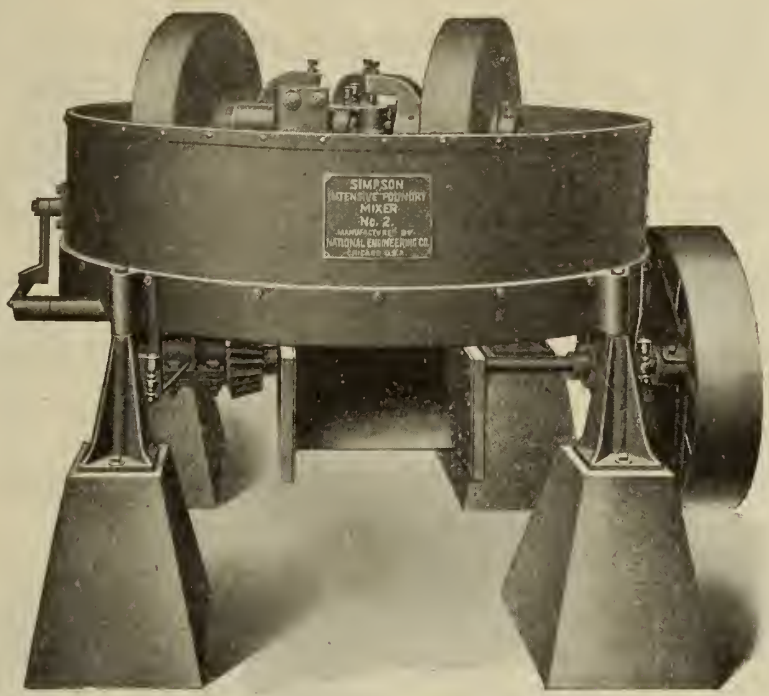
Note the AUTOMATIC DISCHARGE

It saves LABOR BINDER and NEW SAND

It improves the quality of the castings

Its work is done thoroughly not partially

Elasticity and toughness of sand are enormously increased



"The Product of a Practical Foundryman"

Thoroughly amalgamates the mixture

Small H.P. required with a minimum of repairs

Pays for itself in an incredibly short time

Original porosity of sand mixture maintained

Large capacity with a minimum of labor

Will reclaim old and worn out sand and reuse

The large number of Simpson Mixers in use all over Canada and the United States testify to its efficiency. Send for our pamphlet No. 50 and list of many users.

The Six Points of Perfection

1. Correct size and speed of mullers.
2. Effective arrangement of plows.
3. Automatic discharge.
4. Large capacity per area of floor space occupied.
5. Minimum power and maintenance cost.
6. Considerably less new sand and binder required.

NATIONAL ENGINEERING COMPANY

Machinery Hall Bldg., 549 W. Washington St.
CHICAGO, Ill.

GEO. F. PETTINOS
FOUNDRY SUPPLIES
PHILADELPHIA

FOUNDRY FACINGS

Our facings are manufactured from the best qualities of Plumbago and we guarantee satisfactory results from their use in your foundry. A grade to suit your individual requirements can be furnished from our large list of standards. Every barrel shipped has back of it our 27 years' practical experience. The three leading brands are:

GEOGRAPH PLUMBAGO FACING
CEYLOGRAPH PLUMBAGO FACING
MEXIGRAPH PLUMBAGO FACING

ARMOR BLACKING AND CORE WASH

George F. Pettinos

Real Estate Trust Building - Philadelphia, Pa.

Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

GLOBE

Shot Blasting

Instead of Sand Blasting

Ensures 100%

Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.
MANSFIELD, OHIO

DIAMOND

MASTER FLASK

Diamond Master Flasks are light in weight, easy to handle, accurate and very durable. Their convenience and accuracy results in a larger and better production. Let your next order stipulate Diamond Master Flasks.

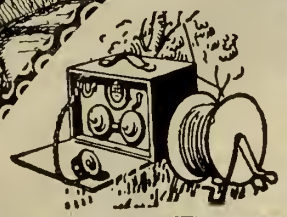
Sold in Canada by

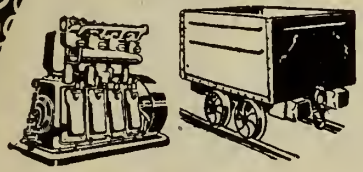
Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

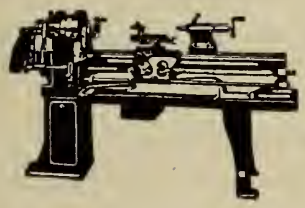
DIAMOND CLAMP & FLASK CO.
40 N. 14th St. RICHMOND, INDIANA

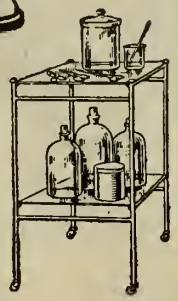
G R

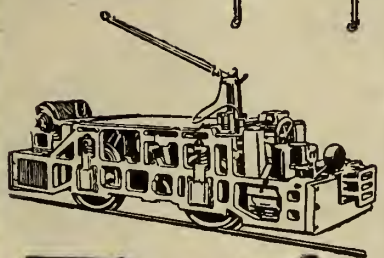
MINISTRY OF MUNITIONS

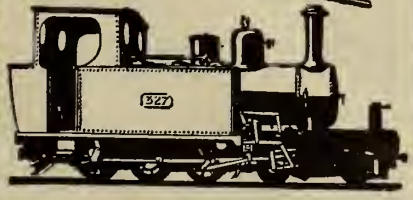












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AVAILABLE FOR EXPORT of

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Buyers should instruct their representatives in the United Kingdom to communicate with the Secretary Disposal Board, Ministry of Munitions, Caxton House, Tothill St., London, S.W.

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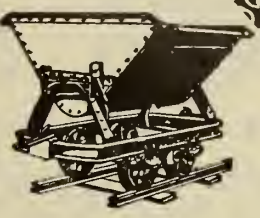

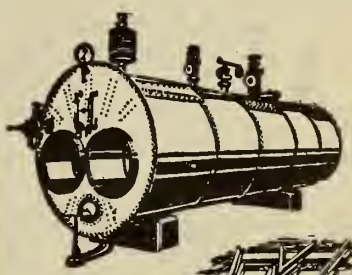

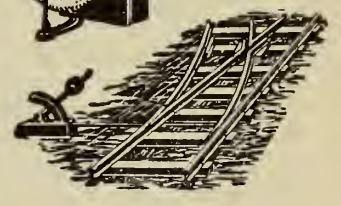

Warm Feet

Means Productive Hands

If the foundry floor is drafty the workmen will pay more attention to keeping their feet warm than to moulding, casting, or pouring. A Robert Gordon, Inc., heating installation will heat your foundry efficiently and economically.

"Gordon—A Guarantee of Dependable Service"

Robert Gordon, Inc., engineers, have studied the many phases of industrial heating and ventilating for years. The Mechanical Hot Blast Heater is a heating unit developed out of this study and experience, to which has been added correct manufacturing practice.

The Mechanical Hot Blast Heater, makes use of radically different principles from the old line of heaters. A multivane fan directs the heat **along the floor,** heating the farthest corner and window zone, and keeping the feet of the workmen warm. Irritating fumes and steam are eliminated, and the air kept moist and clean.

The Mechanical Hot Blast Heater, used to prevent sand freezing, will effect a saving of from 50 to 66 2/3 per cent over salamanders burning coke.

Any fuel can be used—soft coal, coke, gas or oil, and at a considerable saving—as high as 50 per cent. in some instances.

Send for the free booklet, "Warm Facts in Cold Type" to-day.

Robert Gordon
Inc.
628 W. Monroe Street
CHICAGO

Branch Offices:
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Bessemer Bldg., Pittsburgh
Sun Bldg., Detroit

Canadian Agents:
E. J. Woodison Co., Limited
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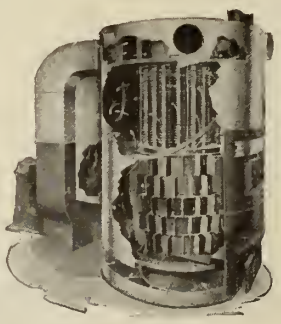
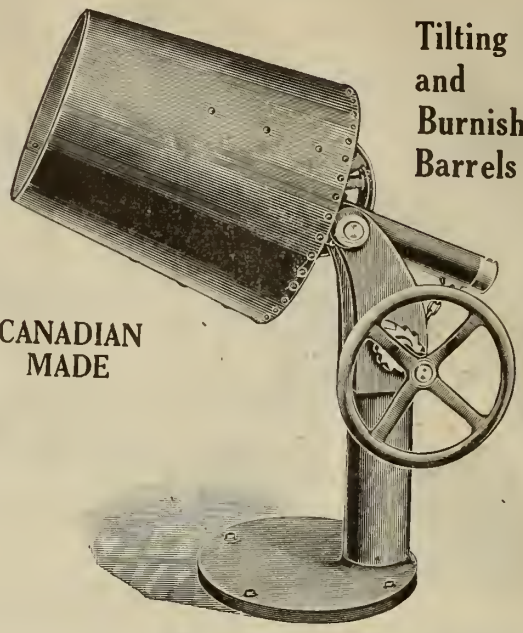


The Mechanical Hot Blast Heater

Tumbling Barrels



Tilting and Burnishing Barrels

CANADIAN MADE

SLATER & BARNARD
LIMITED
Hamilton, Ontario

Single File Tumbling Mill

EXHAUST TUMBLING MILLS

Constructed of heavy steel plate

Equipped with renewable inside end linings, ring oiling bearings and all features which make for high-class product.

BULLETINS ON REQUEST

Manufactured in Canada by

THE R. McDOUGALL CO., LTD.
GALT, ONTARIO

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Beginning with 1921, in order to stimulate McLain men to greater achievement, we are going to offer a McLain medal and cash prizes for various classes of semi-steel castings, the best cupola practice, etc. A *committee* appointed by members of the McLain Alumni will draft the rules and regulations governing the contest.

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No. 449 “ “	21″ x 22″
No. 449L “ “	20″ x 29″
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Cast Iron Pipe Founding at Fort William Plant

Description of an Extremely Efficient Method and Equipment for Making Cast Iron Water and Gas Pipe

By P. R. HURLEY

THE Canada Iron Foundries, Ltd., are just completing extensive alterations to their Fort William plant and, among other changes, have completely remodelled their cast iron pipe shop in order to bring this department more in line with modern practice. While this shop is not exceptionally large, still it is most up to date and efficient. It is the only shop of its design in Canada, and among the two or three such that exist on this continent, and contains very many interesting features from the point of view of the cast iron pipe manufacturer.

The new equipment and methods of casting are modelled along the lines of those in use at the plant of the James Oakes Co., at Riddings, Alfreton, Eng., and in addition the shop contains many unique features of the company's own design. It differs from the plant above mentioned, in that casting is done in pits as per the usual practice, while they have their turntables set on ground level, and cast from the second story, as it were.

Work was started in January last, the whole interior of the old building being torn out, the old pit being widened and lengthened to accommodate the turntables and socket core ovens, new walls put in, etc. Plans called for the erection of a new core room on the south side of the shop, the installation of a gas producer plant and piping, and of three separate and distinct units for pipe-making which could be worked individually or all together as desired and consisting of one rectangular pit, shown in Fig. 3, served by two travelling cranes (to be completed first) and two turntables, Fig. 4, to be served by special centrally located electric jib cranes.

Producer Gas Used Exclusively

One of the most noteworthy features in connection with this plant is the exclusive use of producer gas for all heating and drying purposes. This method of drying cores, molds, etc., while extensively used in European countries, has not received much consideration from cast iron pipe manufacturers on this continent, due probably to the existence, hitherto, of cheap and easily obtained coke. Gas is supplied by two D-4 Duff gas producers manufactured by the Dowson & Mason Gas Plant Co., of Levenshulme, Manchester, Eng. Each of these producers is capable of gasifying 1,100 pounds of coal per hour, and being worked with steam blast at approximately 70-80 pounds pressure, furnish what is known as a "semi-water gas." After some experimenting it was decided to use for fuel a mixture of pea coal and coke braize or screenings, this being found to furnish a very satisfactory gas of high calorific value, and economical in that it made use of a portion of the coke pile that was formerly of little use. That portion of the piping which receives the gas from the producer outlets is composed of fabricated steel plate lined with fire-brick to withstand the intense heat of the gas, and provided with suitable doors to permit entrance for cleaning at required intervals. The main itself leading from the producer house to the foundry is built entirely of brick, the mortar used being a mixture of fire clay and cement. The piping throughout the foundry is cast iron exclusively. The whole system is provided with explosion doors at designated points to prevent any possible damage that might be caused by explosions.

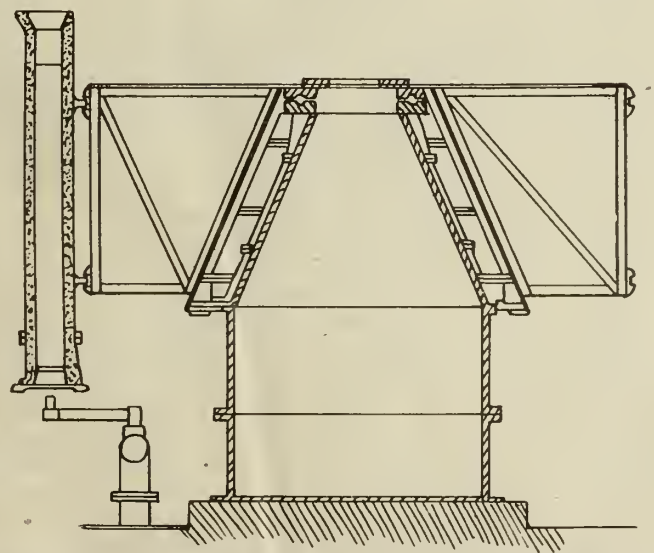

FIG. 1—Turntable and ramming stool. Note lugs on opposite side for holding flask. Flasks are held the entire circumference of table, as one mold is rammed, the table is rotated, bringing another into line to be rammed.

Same Flask Used Four or Five Times Per Day

The chief advantages of this method of drying are the increase in production that is secured and the smaller initial outlay required for flasks and equipment. Instead of obtaining one pipe in one flask per day, as in the old system, as many as four or five pipes per day can be obtained from each flask. This is rendered possible through individual drying — each flask being placed directly over a gas burner, the jet lighted, and the heat, passing up the inside of the mold, drives the moisture to the outside of the flask through the vent holes. As soon as the inside surface of the mold has become sufficiently hot ("skin-dried" is the term used) the flask is set up for casting and poured. Immediately the iron has set, the pipe is withdrawn, and the flask is clamped up ready for ramming again. Now as the flask is still very hot it requires less time to dry the succeeding molds. Some very remarkable times have been achieved at this plant, molds having been dried in 35-40 minutes in hot flasks and the whole cycle of operations having been gone through, i.e., from first to second ramming, in an hour and a quarter.

Core Ovens Fired With Gas

All core ovens, whether for body, socket or centering cores, are gas-fired, and also the ovens in dressing shed

for heating the pipe previous to their being tarred. Results from all these are extremely satisfactory and the dressing shed ovens possess an additional advantage in that they not only heat the pipe up to the required temperature more quickly but they do away with the wood smoke and coke fumes, which were very obnoxious, especially in winter time when all doors and windows had to be kept closed.

The rectangular pit, which was designed for making pipes of 14 inches and upwards on the continuous system, is 75 feet long by 15 feet wide and 14 feet deep. This pit is very flexible and can be used for small sizes and flanged pipe as well as for the larger sizes, but with less satisfactory results. It is served by two ten-ton overhead travelling cranes, and as every movement is carried out by means of these cranes, it is essential that the operators be highly skilled men, and

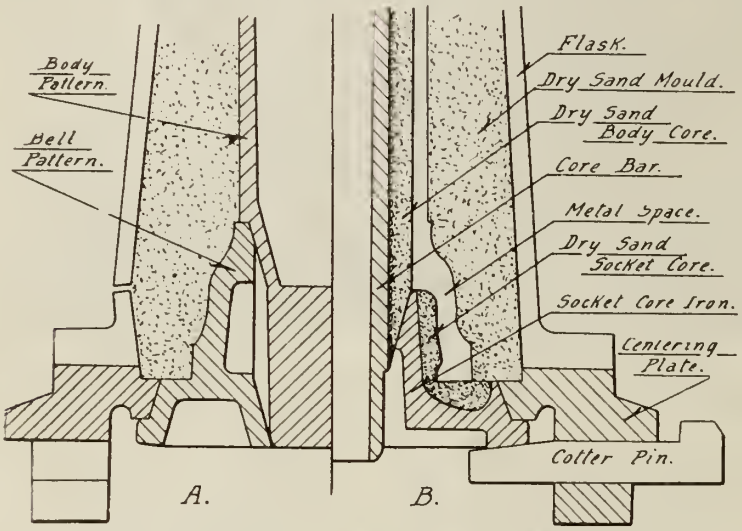

FIG. 2—SECURING MOLD AS CORES, PREPARATORY TO POURING.

perfect a good working arrangement between themselves.

Making the Molds

The cycle of operations can be followed from the accompanying sketch, Fig. 1. A flask is picked up and set over the bell pattern, which is permanently fixed to the ramming stool. Two steel pins, one on either side of the bell pattern, fitting into two pin-holes in the flange of the flask, guide it into position centrally over the bell pattern. The pattern has a tapered seat in the top to receive the tapered end of the body pattern, which is now lowered into place by the crane, and mold rammed up to within 12 inches of the top. Spigot former is now placed in position and the spigot rammed up. Body and spigot patterns are now withdrawn, the former by the crane and the latter by hand, and flask is set off on to the blacking grid. Mold is then blackened with a mineral blacking and placed over a gas port for drying. As soon as dried sufficiently it is removed to the space reserved for casting, and set down on a chill plate over the socket core, both of which have been set up in the meantime. The socket core iron has a tapered seat similar to that in the bell pattern, and into this is now lowered the body core. This body core is held central at the top by means of a ring core, which has on its inside circumference four gates, approximately 1 inch by ½ inch, through which the metal flows. Molds are now poured, core-bars withdrawn as soon as the iron has set; flask containing the pipe picked up and lowered on the shake-out skid, where the clamps are knocked off. The sand falls into a pit beneath where it is wet down with clay water; the pipe rolls along skids towards the cleaning room, while the flask, still hot, is clamped up ready to be set down on the bell pattern and rammed up again.

The remaining two units, which have just been completed, consist of two casting turntables. They are most interesting and constitute a decided departure from the usual line of turntable practice. As mentioned previously these tables are placed in a large rectangular pit 80 feet by 50 feet by 15 feet deep. Owing to their very heavy weight when loaded (approximately 150 tons) it was necessary to thoroughly pile the ground underneath the concrete foundation, on which they rest. The top of this foundation is level with the pit floor. On it stands the turntable base, a cast iron cylinder 9 feet high by 8 feet in diameter, in section 1 inch thick and reinforced by ribs at regular intervals. On opposite sides are two openings, one a manhole, providing entrance in order to attend to the driving motor and gearing, and the other (a smaller opening near the top) allowing the driving shaft and pinion to engage with the bevel gear which revolves the table. Bolted to the top flange of the base is the internal cone. This is approximately 6 feet high and 1¼ inches in section, and was cast in two pieces in order to facilitate machining. At its peak it carries the lower half of the ball cage, and in this is set the ball race, consisting of case hardened steel balls 2 inches in diameter. Over the internal cone is now placed the external cone, which rests entirely on the ball race, not touching at any other point. This external cone is also made of cast iron in two sections which are bolted together. Bolted to its base is a steel bevel gear 10 feet 6 inches in diameter, by means of which the table is revolved. On this external cone is built up a cylindrical steel drum 19 feet in diameter by 7 feet 6 inches high, suitably braced at all points. Bolted to the outside of this steel drum at top and bottom are slotted cast iron rings which carry the flasks. These rings were machined in position. A slide rest was attached to one of the floor columns and the table rotated, this allowing a perfectly even finish to be made. The brackets on the flasks were machined to exactly the same radius as these finished rings, and square-headed bolts, fitting in the T in the ring, then passing through the flask bracket to receive a nut on the outside, hold the flask rigid to the table. This is a very important point, as the center lines of all flasks must be equidistant from the center of the table and absolutely true top and bottom. If this were not so, thin-sided pipe would result.

Special electric jib cranes, constructed by the Northern Crane Works, are set in the center of each table and fitted into bearings at both top and bottom. These cranes have a hook radius of 21 feet and a lifting capacity of 5 tons and 8 tons respectively. Body patterns are set and drawn by means of two ten-ton electric winches, which are placed on special bracing in the roof trusses and controlled from the floor. The table is driven by a 5 horsepower motor through three sets of gearing and when fully loaded can revolve at the rate of one and a half revolutions per minute. A 14-inch semi-circular gas main in which are set enough burners to dry half the flasks on each table, is placed underneath the flasks on one half of the table. In order to further obviate labor, hydraulic lifts have been installed under the tables, one to push the bell pattern into position and the other to place socket cores.

Socket Cores Made on Jolter

Socket cores are being made on Mumford jolt ramming machines instead of by hand as was formerly the case. This is a new departure from established practice in Canada and is proving extremely successful. Cores are made at very little, if any, gain in time per core, but the advantage lies in the lesser effort required from the core maker and the greater uniformity in ramming. Two brick ovens have been built in the pit next the core makers' benches for the drying of these cores.

There are few differences in the equipment as used on these turntables from that used in the straight pit, chiefly in the construction of the flasks and socket core irons. All patterns of course are identical.

The Flasks

Flasks are single, i.e., each contains but one pipe. They were cast in four

sections, the two front and the two back sections being bolted together to form the two halves. The rear half being bolted to the table is fixed, while the front half is held to the rear half by means of two slide bars with stops and swing bars with cotter pins. When it is necessary to separate the halves, all pins are knocked out and the front half is forced along the slide bars near the top, the bottom pivoting on a rounded surface. To the bottom flange of flask is bolted a centering plate, so called, because it contains a tapered seat into which fit the tapered seats on the bell pattern and socket core iron and thus ensures them both being absolutely central in the flask. Another feature worth mentioning from the viewpoint of operation is that all cotter pins are fastened to the flasks by means of small chains, thus doing away with the annoyance and expense occasioned by lost clamps, wedges, etc.

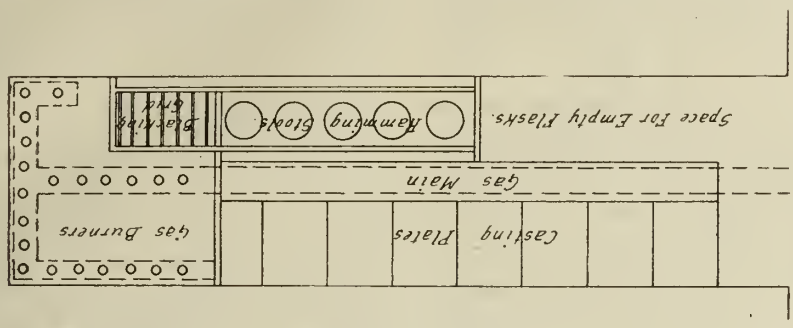

FIG. 3—RECTANGULAR PIT AND GENERAL ARRANGEMENT OF SURROUNDINGS

Core Irons

The present socket core iron answers the purpose of both core iron and chill plate in the old system. Its shape, as will be noticed from the accompanying sketch, permits the core for the face of the bell to be made simultaneously with the socket core. This core for the face of the bell obviates any shrinkage strains which might be set up in this important part, due to a chilled face. A very strong point in favor of this piece of equipment is the ease with which it can be removed after casting. It is held in position by means of two pins and as soon as pouring is over these are knocked out, and nothing holding it but the sand, it either drops out of itself or after being tapped with a hammer.

Cycle of Operations

We now come to the cycle of operations, which is as follows: One of the flasks being in position under the overhead winch, bell pattern is pushed into place in centering ring at the bottom by means of the hydraulic winch. (Note that all these must be in perfect alignment to secure a good pipe). Ramming now commences; then finished patterns are withdrawn and table rotated until the next flask comes in position. Mold is now blackened, and on the next rotation comes over the first gas jet. In succession, as the following flasks are rammed it passes over the entire 18 gas jets, the gasman regulating the flame to suit the requirements of the mold. After coming off the last burner the socket core is placed in position in the tapered seat of the centering ring, and held there by means of two cotter pins as shown in Fig. 2. Body core is now lowered into place by the jib crane, spigot centering core placed by hand, and mold is ready for pouring. When a sufficient number of molds are prepared iron is brought from the cupola by means of an overhead mono-rail runway suspended from the shop columns on the north side of the building, and poured by the jib crane. As soon as iron has set, all cotter pins are knocked out, socket core iron falls to the floor, and body core bar is withdrawn by the crane. Two chains are now lowered through two adjoining pipes and hooked on to the bells; these pipes are withdrawn, forcing the flask halves apart and causing the sand to drop to floor; pipes are taken away to the dressing shed, while sand is wet down, cut over and mixed; then brought upstairs by means of a bucket conveyor and dumped into a revolving screen set over the sand hopper, from where it can be taken as required. Flask is now closed up and ready to be rammed again in its turn.

As will be gathered from the above description the speed at which pipes can be made is regulated by the speed of the rammers. At present ramming is being done by hand, but a couple of ramming machines are under construction and will be installed this winter. These will not only ram a mold very quickly, but also much more uniformly, thus doing away with lumpy pipe. A very little reflection will show the reader the advantages which this system has over the other various methods of pipe-making employed in this country. Initial cost is considerably less owing to the small amount of equipment required to obtain an equivalent output. Complete elimination of all handling of flasks, etc., means lower maintenance costs, as well as the absence of that element of danger which arises whenever loads are carried over the workmen's heads. The smaller number of men required, and the smaller amount of arduous labor exacted from them reduces labor costs, and makes them more contented.

A great many other improvements in the various details connected with this industry have been added, and altogether this shop furnishes a most interesting example of the manner in which this concern is endeavoring to meet the present cost of production, and to offset any inefficiency on the part of labor in their particular line.

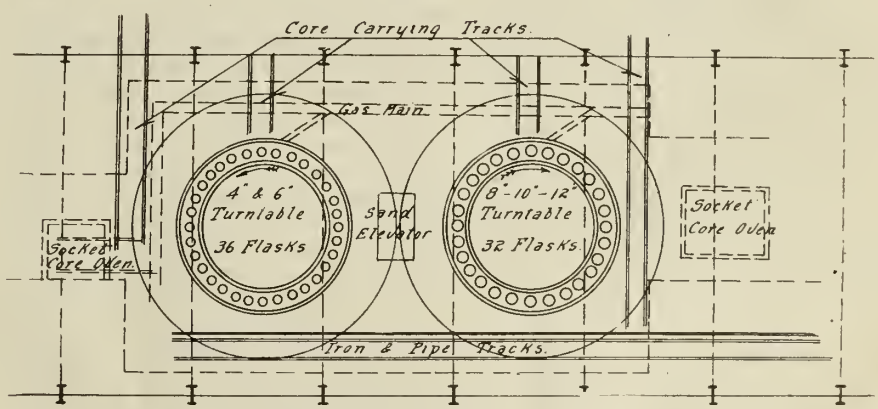

FIG. 4—TOP VIEW OF TURNTABLES SHOWN IN FIG. I. FOR SIZES OF PIPE FROM 4 INCH UP TO 12 INCH DIAMETER.

WHO CONSTITUTE THE UNITED STATES STEEL CORPORATION?

When we read about a strike at the plant of the United States Steel Corporation, do we stop to think who it is that the strike affects? We are led to believe that it is a few millionaires who are oppressing the thousands of poor working men, but the following item of news should show conclusively that the rank and file of the population are to a great extent the owners of this big corporation.

Owners of Steel Common

There are now 90,952 persons who own United States Steel common stock, according to the totals made up by the transfer office on the closing of the books August 30 for the last quarterly dividend. This is a new high record as compared with 87,229 stockholders as shown by the books in June last. The average holding of the stock is less than 56 shares. The number of Steel common stockholders has doubled in the last three years. The majority hold the stock purely for investment.

Designing the Pattern to Save Time in Molding

By Designing the Pattern So That a Roll-up Flask Can Be Used, One Parting Is Dispensed With and No Second Man Is Required

By A. H. OBO

SOME time ago I had an article published in Canadian Foundryman on subject of hinged flasks in which, among other things, I mentioned the lathe bed as a job which could be probably made in this manner. I showed sketches of how it could be done and gave reasons why it was advantageous, but for all of this I could not convince the molders of this class of work that there was anything to compare with bedding a solid pattern in the floor and setting cores to form the inside. Now right here is the trouble with the regulation method of serving an apprenticeship. These men have learned to mold in this manner and can not be convinced that any other way would do. From a jobbing shop standpoint they are right but from a manufacturing standpoint I can not agree. If all shapes and sizes are to be made from one pattern by changing certain parts the solid wooden pattern is undoubtedly the right thing in the right place, but if we are going to have standard designs and go in for quantity production, then I say that an aluminum pattern fitted up with the same care as would be exercised in preparing for an implement job and fitted to a properly made hinged flask has advantages over the solid pattern. Take for instance a standard lathe bed of eight feet in length. My experience has been that a couple of molders and a helper have to go some in order to make one in a day, and with a hinged flask and good pattern I can, without talking through my hat, make two in a day. This, of course might be killing the job and perhaps Canada does not want 8-foot lathe beds in such quantities, but for jobs which will be wanted in such quantities as well as warrant the expenditure I am prepared to bank on its success. Of course lathe bed designs have been greatly simplified to what they used to be, but they are still bad enough.

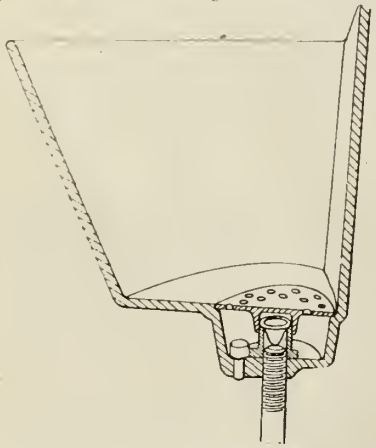

FIG. 1—A NICE ENOUGH APPEARANCE BUT HARD TO MOLD.

There are other worse jobs where draw-back plates are used which could be rolled back to much better advantage. The design of pattern sometimes stands in the way of this method but this can usually be arranged to suit. In designing a pattern for this system of molding the pattern maker should be on the job and be sure that there are no obstructions in the way of the flask swinging off instead of lifting straight. For small jobs the hinged flask has every advantage, and to show its adaptability to certain small castings I will show sketches of one particular casting I have in mind. Of course, in producing any casting for a specific purpose it may be necessary that it should be of an exact

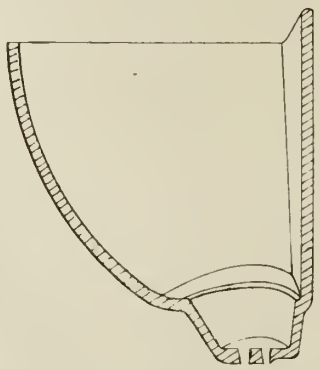

FIG. 2—LOOKS JUST AS NEAT, HAS ALL THE GOOD QUALITIES AND IS EASY TO MOLD.

design, and in such case it is, of course, necessary that the pattern maker design his pattern accordingly; using due consideration for the molding of it with the least amount of trouble. The molder in turn, must make the proper arrangements to do the job. But there are innumerable cases where design is of little consequence and where an easily molded pattern would bring as good a priced casting as a more difficult one. Where this is the case it would look the part of wisdom to choose the easily molded pattern. The casting which I have in mind was one which was produced in quantities running up into the thousands every season and where the design was of no possible consideration. It was what was known as a water bowl for a cow-stable.

For the benefit of those who have never farmed it might be explained that in modern cow-stables the cow is watered without leaving the stall. In fact she does the work herself. A windmill is usually the power which is utilized to drive the pump and the water is forced into an overhead tank, which tank is connected by piping to a small reservoir in the stable. This reservoir is connected by piping with one of these bowls in each stall, or perhaps between two stalls. The bowls and the reservoir must be on the same level so that the water will remain at the same level all the time, and when a cow takes a drink, more water comes to take the place of what she drank. An automatic valve arrangement in the reservoir regulates the level of the water, so that it would appear reasonable that the bowls should simply be connected direct to the pipe. This would be all right were it not for the risk of hay and bran mash, etc., which the cow is apt to deposit in the water getting into the pipes and obstructing them. For this reason each bowl has a check valve and a clean out valve underneath it, and a grate over them to keep the coarser material from getting even as far as the valve chamber. From the information just given it will be seen that the design would be of secondary consideration. The size also would appear to be of little moment, but in case of a number of cows drinking at one time the water might not flow fast enough to keep up the supply, so it is the custom to have each bowl to hold about a good pail of water.

In the illustration Fig. 1, it will be seen the design of the one adopted in the shop which I have referred to, while in Fig. 2 is the design I would substitute, believing that it would be just as serviceable and equally as handsome in appearance. Fig. 1 has all the latest improvements and is certainly a popular bowl, but Fig. 2 has exactly the same features and is much easier to mold.

In Fig. 3 will be seen the mold in which Fig. 1 would be molded. The pattern is fitted into a follow-board, and the nowel is rammed and rolled over. After putting on the parting sand the cheek is rammed and another parting made, and lastly the cope is rammed up. The gate pin, it might be explained, projects up through the cheek and cope unless we see fit to pour it with a pop gate. The first mentioned way is most likely to produce clean castings and unless these

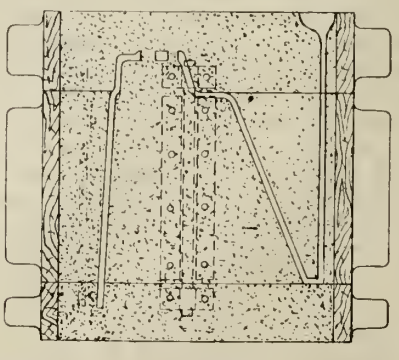

FIG. 3—MOLD IN WHICH FIG. 1 WOULD BE MOLDED.

castings are sound they will not hold water. After removing the gate the cope is to be lifted off. Before lifting it, however, two set-off boxes are put in place, one away over to one side or else up by the sand heap. Another molder is now called away from his own work to assist in lifting the cope. The two molders put the tops of their heads together and look straight down in order to get a good lift. After lifting the cope it is carried to the farther set-off. The molder now swabs his pattern, punches a couple of vent holes in the green sand cores which form the pipe connections, and raps his pattern—the other molder

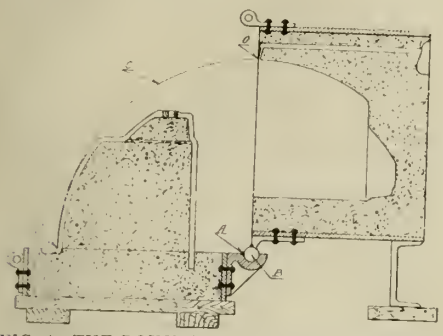

FIG. 4—THE POINT "O" ON THE COPE STARTS FROM THE POINT "O" ON THE NOWEL AND FOLLOWING THE LINE "C" HAS CLEARANCE ALL THE WAY.

standing idle in the meantime. They now put their heads together again and look straight down the guide pins, and prepare for a long, straight, slow and steady lift on the cheek. After setting this down on the near set-off, the second man is allowed to return to his own floor for a little while, during which time the molder cuts the gate and draws the pattern and does the regulation amount of patching, after which the second man is again called up to close on the two parts which are strung along the floor.

In Fig. 4 will be seen how the pattern shown in Fig. 2 would be molded. As with Fig. 1, the pattern is fitted into a follow board and the nowel rammed up first. After this is rolled over the remaining portion of the flask is put on and rammed up and the gate pin removed, when the molder without any assistance rolls it up as shown in Fig. 4, lifts the pattern and rolls the mold shut again.

A roll-up flask invariably lifts clean while a lift-off flask is hard to lift clean. With the equipment as shown a molder can easily make two molds alone while he would be making one by the other process and he does not require to pester his partner in doing it.

There are many jobs similar to this where a molder does double the work required in order to get the mold made, simply because the foundry had no representative in the executive. A bowl with graceful curves instead of all straight lines will hold water just the same as any other design and the part of the cow which would be expected to fit down into a water bowl would, to my notion, fit better into a round bottomed bowl than into a flat bottomed one, and all things considered would look just as neat.

The same job could be put on a match plate to good advantage as it is quite possible to make a hinged flask to work with the match plate in the joint so that when removed the cheek will drop down perfectly straight. Different designs of roll-up hinges are in use for this purpose. However, I think it will be agreed that if judgment is used it will be easy to improve on many jobs which are being done in the foundry by simply changing the design of pattern and using roll-up flasks.

WANTS INFORMATION ON FACING

Question:—In reading your journal, which is full of valuable information of all kinds, I just thought of asking you for some advice. Will you please tell me what are the best methods of getting out good, clean iron castings, that is, castings clear of molding sand and core sand, or in other words, what are the best preparations for facing cores and molds for clean castings?

Answer.—To get a clean casting from a green sand mold, if the casting is any way chunky, you will require to use facing sand as well as plumbago. In mixing facing sand it depends on the nature of the sand as well as the casting how strong to mix it. From 1 to 6 up to 1 to 12 is about the two extremes. As a starter I would suggest using sea coal, although there are some prepared facings that work well. Have the sea coal ground to the same degree of fineness as the sand, for coarse sand use coarse sea coal and for fine sand use fine sea coal. Take six parts of old heap sand and three parts of new molding sand and one part of sea coal. The sand should be dry and the whole mass thoroughly mixed before wetting, after which it should be tempered similar to the sand heap. A few trials will demonstrate if this requires strengthening or weakening. Bag blackening for shaking on the mold should have a good plumbago body, as cheap blackening does not make a nice appearing casting and is apt to run before the metal and make the casting streaked. For heavier castings use plumbago facing by painting it on in a dry state with a camel-hair brush and rubbing it in with the fingers. For castings not considered of sufficient importance to require facing, it is quite possible to make nice castings by putting a small amount of sea coal on the sand heap before cutting it over. This does no harm to the heap and it does not go to waste. Any of it which does not come in contact with the casting the first time will remain in the sand until it does do some good. For facing the cores, a great many of the prepared core binders which are on the market will cause the core to peel without any wash, but where a wash is required, there are numerous core washers on the market which are cheaper and better than can be made in the foundry, but where nothing else is on hand or available a good wash can be made by using bag blacking and wetting it with thin clay wash or thin molasses water.

THE RUMBLER

Next to the cupola and the blower, the rumbler is probably the oldest member of the foundry-equipment family, and while many new devices have been brought in to help out with the work of the foundry there has been nothing to take the place of the rumbler. Last month we learned that the sandblast had become quite popular, which it certainly has, as it does work which formerly went undone, and for that reason we were forced to admit that it was not a substitute for any other device but covered a field of its own. So, while the sandblast is admittedly one of the greatest achievements which the foundry has fallen heir to, it in no way interferes with the work of the rumbler.

When we speak of rumblers, it must not be overlooked that there are different kinds of rumblers. The rumbler which found favor with most foundrymen until quite recently consisted of two cast iron heads supported on trunions and connected by cast iron staves with spaces between the staves to allow the dust and dirt to escape. One or more staves would be removed by undoing the bolts which held them on. The castings would be put in until the rumbler was about full, after which some dry cinders or some stars and sprues would be put in. The staves would now be bolted on and the machine when put in motion would revolve until all the dust was gone, when it would be known that its work was done. This dust was a handy guide but an unpleasant one. The modern rumbler is dust-proof and connected up to an exhaust fan system in such a manner as to place it in the category of modern machines. The home-made rattle barrel of olden times is now a by-gone sore to be forgotten.

MOLDERS ACCEPT BIG REDUCTION

London, Ont., Jan. 4.—Five hundred molders employed by the McClary Manufacturing Company are reported to have decided at a meeting held this morning to accept the company's suggestion that they return to work on Thursday morning at reduced wages. Lieut-Col. W. M. Gartshore advised the men that the McClary Company under existing conditions is unable to find any market for stoves and other products into which high-priced labor had been put. The plant has been shut down for two weeks. The company was prepared to take a chance in disposing of its products if prices could be slashed. Molders who have been earning $35 to $40 on piecework will now be able to earn from $25 to $30 a week. The new rate is 12 1-2 per cent. lower than the scale paid one year ago.

Can You Mix Iron by Chemical Analysis?

Some Questions on Foundry Practice Which the Writer Had to Answer in an Examination on the Above Subject, Together With His Later Studies and Experiences

By W. W. ELLIS, Author of the "Metal Mixer"

HERE are some of the questions the writer had to answer when taking an examination for a position some years ago. You will notice the questions were propounded by someone who pretty well understood how to order castings to chemical specifications. Although there were other questions, such as those relating to static and lateral pressures, lifting pressure of copes and pressure on sides of molds—that is, finding the proper weight to hold copes down and keep molds from straining and swelling on the sides—and other questions concerning the cupola, etc., still we will only take up the mixing of metals and the questions concerning making and running off a small heat. The others we may talk about later.

The first question asked in this series was:

No. 1.—What effect has silicon on iron? What per cent. of it is lost in melting?

No. 2.—What effect has phosphorus on iron? What per cent. of it is lost in melting?

No. 3.—What effect has sulphur on iron? How much is lost in melting?

No. 4.—What effect has manganese on iron? How much is lost in melting?

No. 5.—What kind of iron will graphite carbon be found in? And in what kind combined carbon? How much is lost in melting?

No. 6.—What is the composition of German silver?

No. 7.—Give the composition of a good Tobin bronze.

No. 8.—Give the composition of a good aluminum bronze.

No. 9.—What is the composition of yellow brass?

No. 10.—From the following irons make up a heat, and cast the different pieces in their proper order.

A. One cylinder liner, inside diameter 2 feet by 4 feet deep and 2½ inches thick. Specification for liner, silicon 1.0 per cent., manganese 1.0 per cent.

B. Two gas engine cylinders weighing 1,250 pounds. Specification for cylinders, silicon 1.8 per cent., phosphorus 0.5 per cent., sulphur 0.07 per cent. or not over 0.09 per cent., manganese 0.7 per cent.

C. 1,000 pounds of resistant grids. Specifications for grids, silicon 2.75 per cent., phosphorus 0.7 per cent. or over.

D. 7,500 pounds for medium machinery work. Specifications for machinery castings, silicon 2.25 per cent.

The different irons from which to make the mixtures were given as follows:

Brand	Silicon	Phosphorus	Sulphur	Manganese
Pig iron	3.50%	0.9%	0.016%	0.45%
Pig iron	2.70	0.5	0.030	0.50
Scrap iron	2.25	0.6	0.070	0.40
Scrap iron	1.70	0.5	0.06	0.40
Scrap steel	0.20	0.02	0.03	0.40

And 80 per cent. ferro-manganese for those mixtures which required more manganese than the various irons gave.

The cupola was supposed to be a 36-inch inside of lining, so 1,500 pound charges were figured on.

Here are the answers that were sent in, as near as I can get them together.

No. 1.—Silicon will soften iron up to 3.5 per cent. It will help to convert combined or hard carbon into graphite or soft carbon. Silicon while melting loses about 0.2 per cent.

No. 2.—Phosphorus increases fluidity in iron. It has a tendency to make the iron weak, so should be kept low if strong castings are wanted. There is no loss or gain in melting.

No. 3.—Sulphur will harden the iron, cause dirt and blow holes, if too high. Sulphur gains in melting about 0.035 per cent., chiefly from the fuel.

No. 4.—Manganese is a cleanser, and will reduce the sulphur. While melting we lose about 0.2 per cent.

No. 5.—Graphite carbon is always high in soft iron. Combined carbon is always high in hard iron. There is no loss in melting carbon, only one form will change to the other, according to the influence of the other elements.

No. 6.—German silver: copper 50 per cent., zinc 25 per cent., nickel 25 per cent.

No. 7.—Tobin bronze: copper 59 per cent., tin 1 per cent., zinc 40 per cent.

No. 8.—Aluminum bronze: copper 90 per cent., tin 8 per cent., aluminum 2 per cent.

No. 9.—Yellow brass: copper 66 2-3 per cent., zinc 33 1-3 per cent.

No. 10.—A cylinder liner 24 inches diameter by 48 inches deep by 2½ inches thick. Will weigh about 2,600 pounds, so will make two charges of 1,500 pounds each.

Silicon.

	%
Scrap iron, 66 2-3% of 1.5% silicon	= 1.133 1-3
Scrap steel, 33 1-3% of 0.2% silicon	= 0.066 2-3
	1.200
Loss in melting	= 0.2
Percentage of Silicon in casting	= 1.0

Manganese

	%
Scrap iron 66 2-3% of 0.4% mang.	= 0.266 2-3
Scrap steel 33 1-3% of 0.4% mang.	= 0.133 1-3
	0.400
1% of 80% Ferro-Mang.	= 0.8
	1.200
Loss in melting about	0.2
Manganese in casting	= 1.0
Scrap iron, 66 2-3% of 1500 lbs.	= 1000 lbs.
Scrap steel, 33 1-3% of 1500 lbs.	= 500 lbs.
Two charges each	= 1500 lbs.

Two Gas Engine Cylinders

Silicon

	%
Pig iron, 45% of 2.7% silicon	= 1.215
Scrap iron, 45% of 1.7% silicon	= 0.765
Scrap steel, 10% of 0.2% silicon	= 0.020
	2.000
Loss in melting	= 0.2
Silicon in casting	= 1.8

Phosphorus.

	%
Pig iron, 45% of 0.5% phos.	= 0.225
Scrap steel, 45% of 0.5% phos.	= 0.225
Scrap steel, 10% of 0.02% phos.	= 0.002
Phosphorus in casting	= 0.452

Phos. neither gains or loses in melting.

Sulphur.

	%
Pig iron, 45% of 0.03% sulphur	= 0.0135
Scrap iron, 45% of 0.06% sulphur	= 0.0270
Scrap steel, 10% of 0.03% sulphur	= 0.0030
	0.0435
Sulphur gains in melting	= 0.035
Sulphur in casting	= 0.0785

Manganese

	%
Pig iron, 45% of 0.5% mang.	= 0.225
Scrap iron, 45% of 0.4% mang.	= 0.180
Scrap steel, 10% of 0.4% mang.	= 0.040
	0.445
0.57% of 80% Ferro-Mang.	= 0.456
	0.901
Loss in melting about	0.2
Manganese in casting	= 0.701
Pig iron, 45% of 1500 lbs.	= 675
Scrap iron, 45% of 1500 lbs.	= 675
Scrap steel, 10% of 1500 lbs.	= 150
Two charges each	= 1500

Resistant Grids.

Silicon.

	%
Pig iron, 56% of 3.50% silicon	= 1.96
Scrap iron, 44% of 2.25% silicon	= 0.99
	2.95
Loss in melting	= 0.20
Silicon in casting	= 2.75

Phosphorus.

	%
Pig iron, 56% of 0.9% phos.	= 0.448
Scrap iron, 44% of 0.6% phos.	= 0.264
Phos. in casting	= 0.712
Pig iron, 56% of 1000 lbs.	= 560 lbs.
Scrap iron, 44% of 1000 lbs.	= 440 lbs.
One charge of	1000 lbs.

Light Machinery Castings.

Silicon

	%
Pig iron, 16% of 3.50% silicon	= 0.56
Scrap iron, 84% of 2.25 silicon	= 1.89
	2.45
Loss in melting	= 0.20
Silicon in casting	= 2.25

Sulphur

	%
Pig iron, 16% of 0.016% sulp.	= 0.00256
Scrap iron, 84% of 0.070% sulp.	= 0.0588
	0.06136
Sulphur gains in melting	0.035
Sulphur in casting	= 0.09636
Pig iron, 16% of 1500 lbs.	= 240 lbs.
Scrap iron, 84% of 1500 lbs.	% 1260 lbs.
Five charges each	= 1500 lbs.

14,500 pounds of iron was charged to run off the heat. The hardest iron casting was taken down first. Then the cylinders. Then the softest iron for the resistant grids. These grids are usually about ⅛ inch thick by 1½ inches, and they are shaped something like a piece of wire you would bend several times to fry meat on in camp. They have to be very soft. The general floor work was taken down last, which was supposed to be comprised of light machinery work.

You will notice the small amount of pig iron it takes to make that mixture, and the mixture is pretty high in silicon too. But when you know you have pretty good scrap and high silicon pig, if you can mix by analysis you can save on the pig iron. No mention was made of coke or anything else. It seems as though they only wanted to know how you would charge the iron for the different castings, and if you could mix by analysis. Mixing by analysis is simple enough when one has learned or understands a few things connected with it, which anyone can master in one evening of study. And these few things are: we must know the composition of the iron we are mixing—this we get from the man we buy the iron from, that is, the pig iron—the per centage of the different elements it contains, their influence and relation to one another, and above all the percentage of the most important of these elements castings designed for different kinds of work should contain. In the common run of foundry pig iron there are several of these elements or impurities as they are sometimes called. But there are only five we are mostly interested in. They are silicon, phosphorus, sulphur, manganese and the carbons. Of these five I think the carbons are the most important because carbon is the element that gives the iron its character. Foundry iron contains carbon in two distinct forms, called graphite carbon and combined carbon, and according to the percentage of each of these carbons, so will the iron be soft, medium or hard. Graphite carbon is always high in soft open grained iron, and combined carbon is always high in hard close grained iron. In making mixtures for the cupola it is a more difficult proposition to take hold of the carbons and figure their content than it is silicon or some other element, so as a rule if we wish to reduce or change the carbons we generally add some low carbon steel scrap or change the carbons by using high or low silicon in the mixture as the case may require. In making mixtures for the ordinary run of machinery castings, we do not trouble about the carbons, because we find if silicon is high graphite carbon will be high also, and if silicon is lowered graphite carbon will be low, and combined carbon will be high, and the more we lower the silicon the more combined carbon we will get in our castings. Chemists long ago proved if we wish to regulate the carbons it can be done through the silicon, which at once proves that silicon is one of the most important, if not the most important element the founder has to work with. Not only does it influence the carbons, but the other elements also, to a certain extent, for we find if we get silicon normal for the class of work we are making the other elements also will be normal, especially if we use the ordinary run of foundry irons. As silicon can be increased or reduced as required, it is the first element that should be figured in making mixtures by chemical analysis.

Silicon is supposed to be a softener. So it is when iron contains no more than 3½ per cent., but if iron contains more than that amount it will begin to harden the iron. It will not make it hard and strong like a low silicon iron would be, but hard, short, and brittle. In making mixtures we never figure the iron to contain more than 3¼ per cent., and even that percentage is very rarely used, except in fine stove plate work, toys or work similar to it. There are special mixtures, however, for acid proof castings that call for a higher per cent. of silicon, but these are exceptional, and of course are very brittle, but they are not included in the ordinary run of foundry products.

IRON AND STEEL EXPORTS FROM U. S. AND FROM U. K.

The following information is taken from a bulletin issued by the Toronto office of the Department of Overseas Trade to its overseas officers and supplied to Canadian Foundryman by the officer in charge:

The abnormal demand, since the armistice, for iron and steel material from consuming industries in Great Britain has absorbed a very large part of the British production, and the volume of export trade has consequently been limited. It is interesting to observe the extent to which American export trade in iron and steel has benefited by this state of affairs, and from the absence of competition from the Continent of Europe, as disclosed in the following statistical statement compiled by the National Federation of Iron and Steel Manufacturers showing the exports of iron and steel from the United States and the United Kingdom according to country of destination.

All figures are given in thousands of tons:

Exported to	United Kingdom.					United States.			
	Average Monthly, 1912.	Average Monthly, 1913.	Average Monthly, 1919.	May, 1920.	July, 1920.	Average Monthly, 1912.	Average Monthly, 1913.	Average Monthly, 1919.	May, 1920.
United Kingdom	.....	.....	.....	.....	.....	19.8	22.4	18.2	24.4
United States	10.6	14.1	3.9	5.4	7.1	.....	.....	.....	.....
France	14.1	15.5	18.3	21.0	22.4	.....	0.2	33.3	6.7
Germany	24.0	16.1	.....	6.8	4.6	0.5	0.5	.....	.....
Belgium	8.7	8.8	7.3	14.7	19.9	1.8	1.9	.....	.....
Italy	12.1	10.8	5.8	18.7	11.9	0.8	1.9	21.3	5.6
Australasia	52.8	52.7	15.0	17.8	24.3	8.8	13.6	4.8	2.8
S. America	22.3	27.5	3.5	8.3	16.0	44.0	22.8	43.4	59.7
Japan	22.5	17.9	9.9	21.7	10.1	12.1	12.5	50.4	79.2
Canada	12.0	12.2	1.0	1.8	2.8	82.4	82.0	43.4	46.2
India	29.7	39.3	11.1	34.7	31.0	3.2	2.4	5.6	3.9
British East Indies ..	25.2	30.9	14.3	29.4	29.0	.....	.....	.....	.....
British South Africa.	17.6	19.1	6.6	12.7	16.1	3.0	3.0	3.1	5.8
Norway	4.1	3.1	3.7	5.2	4.2	0.5	0.6	.....	0.7
Other Countries, not specified	144.9	143.0	85.0	128.0	169.1	24.6	77.2	138.6	163.7
Total	400.6	411.0	185 4	326.2	368.5	201.5	241.0	362.1	398.7

It will be seen that America has succeeded in increasing her trade considerably with South America and Japan, while the figures relating to "other countries, not specified" indicate that her trade expansion has been fairly general throughout the world.

The figures relating to the trade done with Canada are significant if it may be presumed that the reduction in Canadian imports of iron and steel is due to the development of the Canadian iron and steel industry.

The following particulars relating to the United Kingdom production of pig iron and steel in September have been furnished by the National Federation of Iron and Steel Manufacturers.

The production of pig iron in September amounted to 741,000 tons; this is slightly less than the totals in July and August, which were 750,600 tons and 752,400 tons respectively. The average daily rate in September was, however, 24,700 tons compared with 24,213 tons in July and 24,271 tons in August.

The production of steel ingots and castings, which had, owing to the holidays, fallen from 845,000 tons in June to 789,900 tons in July and 709,200 tons in August, rose in September to 883,900 tons, which is the highest figure attained since the armistice.

Included in the production of 741,000 tons of pig iron are, 278,100 tons of hematite, 251,000 tons of basic, 132,000 tons of foundry and 48,300 tons of forge iron.

The following table compares the production of pig iron and steel in the first nine months of 1919 and 1920:

	Pig Iron		Steel Ingots and Castings	
	1919 Tons	1920 Tons	1919 Tons	1920 Tons
1st 6 mo.	3,954,000	4,145,000	4,264,000	4,877,000
July ..	641,000	750,600	618,000	789,900
August .	521,000	752,400	474,000	709,200
Sept. ..	581,000	741,000	718,000	883,900

Care of Machines and Other Foundry Equipment

After Years of Obstinate Opposition the Managers Yield to the Wishes of the Foundry Superintendent and Provide Him With an Expert to Keep the Equipment in Order

By DAVID McLAIN

"WHERE are we going to secure capable foundry executives; men whose education includes a practical knowledge of metallurgy and the science of melting, molding, molding machines and other labor saving equipment?" asked Mr. Smith, a manufacturer who also owns a foundry.

"What are you doing in that direction?" I asked, and he admitted that they had done little but talk about it at their meetings. At the last session a poll was taken to learn the opinion of those present, but the results were not very gratifying. He said: "Williams, our manager, believed everything was all right when everybody was doing their bit, but agreed that the labor shortage had retarded their production somewhat."

Jones, the machine shop superintendent, was very severe in his statements concerning the loose methods employed in their foundry. He claimed that the output from the molding machines was only about half, that the castings were hard and that the surface of the castings was dirty although they had a fine sandblast equipment.

The chemist reported everything going along nicely in his department when the iron was poured hot and the different mixtures were properly used; that is, when No. 1 mixture was poured into molds requiring No. 1 iron instead of hard iron in soft castings, and vice versa.

Foundry Not Running Smoothly

He admitted that the cupola was behaving badly but only a few days ago he was fortunate in securing the services of a young man who understood English, to supervise the charging of the cupola, and that, he said, would help some.

He declared that the pig shortage was affecting the quality of their products somewhat as he cut down the pig to 40 per cent., using 60 per cent. scrap.

The foundry superintendent took exception to some of the statements made by the chemist. Mr. Smith, the manufacturer, said the meeting ended in a very inharmonious manner and suggested that I visit his plant and discuss the situation with the head of each department in order that we might devise some plan of action.

This paper was read at the American Foundrymen's Convention at Columbus, Ohio, in October last, which fact reminds us of the banquet tendered by Mr. McLain, in which we were permitted to participate. It also brings to our mind the photograph which was taken after the banquet, in which we also held a conspicuous position. —Ed.

Smith seemed to think that I should interview Mr. Jones, the machine shop superintendent, who he said was a pretty broad-gauged fellow and had studied the foundry operations from every angle. He was a stockholder as well as a director of the company, a forceful, energetic, practical machinist who had worked right up from the bottom.

The Machine Shop Man's Story

Let me tell you his story:

"About ten years ago we introduced the premium system in the machine shop and endeavored to put it in the foundry, but failed—not because the molders would not adopt it, but because the foreman and superintendent objected to it."

"Why did they object?"

"They claimed it was all very well to increase the speed of my machines, to use high-speed steel and to use portable cranes for medium and traveling cranes for heavy castings, but it required very little extra effort for the machinists to increase their output, while increased production in the foundry **meant** increased physical exertion for **the** molders."

"Why didn't you install labor saving equipment in the foundry?"

"We bought power squeezers, various types of molding machines, jar rams, air rammers, pouring devices, new blower, cupola, sand and cinder mills, sand cutter, sandblast, and we then believed we had solved our foundry problems.

"We obtained more perfect castings—more of them—cleaner than before, etc., but in a short time things began to go wrong."

"Before proceeding further, please enlighten me on a few points that are not quite clear. You invested quite a sum in foundry equipment but did you secure experienced operators?"

"I will admit we left that to the foundry executives."

"Are your foundry relations pleasant?"

"Yes."

"Let us visit the foundry."

The superintendent and foreman were very glad to discuss the foundry situation. The foundry superintendent, Mr. McArthur, said: "We were given a lot of new equipment and a demonstrator for a few days to teach the men how to operate each machine, but not a man in our employ had ever made a mold on a machine, nor understood rigging up for machines.

"I advised that we engage an instructor for the molding machine department—one who would teach the beginners and adjust or repair the machines when out of order. He should also be capable of laying out the patterns or match plates, and such a man would be worth his weight in gold, but as he demanded more salary than I was drawing, both Smith and Jones refused.

"Now a molding machine with patterns well fitted, is a producer and cost reducer but, if anything goes wrong, they produce bad castings just as quickly.

No Mechanic for Foundry

"They expected me to fuss with sandblast equipment and sand cutting machines, and Jones even refused to transfer one of his mechanics to the foundry payroll in order to keep the equipment in repair, so I handed in my resignation.

"Both Smith and Jones knew my heart

PHOTO OF McLAIN ALUMNI TAKEN AFTER THE BANQUET AT FOUNDRYMEN'S CONVENTION, COLUMBUS, OHIO, OCT. 4-8, 1920.

was in my work, that I owned my own home and that I would have to leave town, so they refused to accept the resignation and gave me an increase in salary.

"They have not interfered but have given me no assistance, neither in experienced help or in obtaining apprentices for the foundry although they offer fancy inducements to machine shop apprentices. I wanted to indenture apprentices by paying them $10 a week and a bonus, and I would guarantee to make $30-a-week men out of them the first year, but nothing doing, as Smith and Jones only got $2.50 per week as apprentices and could not find it in their hearts to pay more than they received.

"Now our chemist is a fine, clean-cut fellow, but he did not spend six years in college to become a melter, nor will he devote much of his time to the foundry.

"He claims the cupola is in my charge but I maintain that the party responsible for the metal must exercise control over the melting department, and he lets the cupola go hang, which it does at times.

"For some months our iron has been on the dull side. He was using 425 pounds of coke (whether it was high or low carbon) to 4,200-pound charges of iron and it was necessary for me to call on Mr. Smith to change that to 525 pounds of coke to 5,500-pound charges of iron. Since then we are getting hotter iron and three tons more per hour.

"Only a few days ago I went up on the cupola platform and the crew was just finishing a charge. Everybody was chattering; no one was thinking, so they began tossing in pig for the next charge instead of coke.

"The following day I discovered that our metal was low in silicon and manganese and I spent 30 minutes on the cupola platform while they threw in several charges of iron and coke but forgot to add the ferrosilicon and ferromanganese.

"A condition like that is demoralizing, but fortunately the chemist happened along in this emergency and I believe realized for the first time the absolute necessity for co-operation.

"Although it is now six years since I have been laboring with the equipment, I maintain that it has cost this firm a fortune by not engaging instructors or inspectors.

Superintendent Irons Out Difficulties

"Here is an ash-pit casting for furnaces. A molder and helper made 11 per 10-hour day before we installed that machine. Now a molder and three laborers make 45 castings per day with a record of less than 2 per cent. loss. Just how much of my time was spent on that job before we got it going good, I don't know, but it isn't wise to let those fellows run loose or things go wrong.

"Only the other day 20 ash pit castings were lost in one heat, so I had to drop everything else and check up, or in other words, learn the cause of the trouble. I found the flask pins on the cope plate to be loose and as the drag had to be turned over, this threw the shift all on one side. The section of castings being only 3-16 to ¼-inch thick, this shift left 1-16 inch of metal in spots, which is entirely too thin.

"The molders had blamed the loss to dull iron, which was not allowed when I checked up and discovered the cause which could easily have been averted if the men had understood how to prevent it, which I hope they do now.

Must Inspect Machinery Daily

"Take a sand cutting machine, for instance. There never was a better investment made in this foundry, but look at

DAVID McLAIN.

the construction of it and then figure what it is up against in the way of mud, dirt, gaggers, etc. If you want to keep that going every night, it must be inspected daily, oiled and kept in good shape.

"Sandblast equipment is as much machinery as the finest lathe, but I ask you to consider the character of the labor employed on each. A fine lathe is well taken care of but how about the sandblast? The machine shop superintendent is capable of repairing and testing the lathe because he knows the construction and operation of same, but how about the sandblast and other complicated equipment in the foundry? The nature of sandblast equipment makes it deteriorate rapidly if not kept up, but are you going to depend on the foundry labor to keep it up?

"We have all kinds of trouble with our electric riddles and air hammers. Sand gets into the bearings—and by the way, if you will collect the air rammers every night and lay them in a bath of kerosene, blow out next morning and use a little good machine oil, you will secure better service."

We continued the discussion at luncheon, being joined by Mr. Smith and the manager, Mr. Williams.

The foundry superintendent had his subject well in hand and was allowed full swing until he delivered the following:

"I have studied the conditions in our foundry from every angle and maintain that we can never hope to attain 100 per cent. efficiency by studying efficiency or business courses. We require 100 per cent. common sense first of all, and should apply it to our problems.

"Take our cupola practice for instance. If the chemist is going to make the mixtures, let him master the science of melting first of all. If the metal is not hot, what's the use of speeding up the men? If the molding machines are not kept in repair, cleaned and oiled daily, and the flask equipment is deteriorating, there will be large casting losses.

"If the sand mixing, cutting and blasting machines, air and electric hoists, traveling cranes, blowers, and other similar machines are not kept in repair the foundry will not receive proper return for the money invested in this expensive equipment, and even though it would be of the most modern type it is not worth much if it is idle part of the time because proper attention is not given to repairs and maintenance."

Proprietor Is Finally Won Over

Here the foundry superintendent was interrupted by Mr. Smith, who said:

"Just a minute, this is a new angle to our problem. I don't think I have ever before considered the maintenance problem from the standpoint of return on investment. I think the foundry superintendent has stated the case thoroughly and although I have been opposed to spending too much money on mechanics in the foundry, I believe I am beginning to see that unless some thought and attention is given to the care of this equipment, it might just as well not be taking up space in the foundry."

Turning to Mr. Williams, the manager, he asked:

"Why don't we try this plan that the foundry superintendent has been trying to adopt all these years? I will admit that Jones, you and myself probably have been a little too cautious in our handling of the problem. We have opposed the foundry people simply because we haven't had the nerve to break away from tradition. Just because foundrymen in general all over the world have neglected their machinery and equipment ever since they had anything that deserved the name of a machine, is no reawhy we should keep on. Here we have thousands of dollars tied up in the molding machines, sandblast apparatus, air compressors, electric cranes and pneumatic tools and yet we are daily entrusting this expensive equipment to the mercies of some of the poorest men we have in the plant.

"Williams, you and I have been using our antiquated methods for the last five or six years; what do you say we give the foundry superintendent a fling at his own scheme?"

Turning to the foundry superintendent, he said: "McArthur, this afternoon we will go to Jones and pick out one of the best all around mechanics he has in his shop. We will transfer this man to the foundry and explain to him that he is to have complete charge of keeping up the machine equipment in that depart-

(Continued on page 46)

What is Malleable Iron and What are its Uses?

Defining the Process of Manufacture; How It Differs From Gray Iron and Steel and What Are the Many Uses to Which It May Be Put

THE fact that Canada is forging ahead at a phenomenal rate and that industries of every description are springing into existence in every part of the country brings the metal industry to the forefront to probably a greater extent than any of the others, for the reason that it would be a difficult proposition to launch into any kind of an enterprise or install any kind of equipment without depending on the metals. This brings up the question which is the most suitable metal to use for each line of work and also the question of building foundries, etc., to supply the additional demand for these metals.

It is not the purpose of this article to propound the superior merits of one metal over another nor to give any advice on which one to use, but simply to bring out what has been the result of recent investigation and research in connection with one of the branches of the foundry field, viz., that of malleable cast iron.

As we pointed out in the last issue the process of making malleables has been known in a minor way since the year 1720 and has been experimented with and improved upon with more or less success ever since. The successes however, which crowned the efforts of these who had it in hand were not what they might have been, had the idea of secrecy been eliminated, and as a result malleable iron did not receive the attention which was accorded to other metals, the secrets of which could not be kept. All this has changed now, and malleable iron is in the race and holding its own. A description of its characteristics, the process of manufacture, together with examples of the various uses to which it may be put, will be in order.

Editor's Note: This article is the beginning of a series of articles on malleable cast iron. In the next issue some of the research work carried on by the American Malleable Castings Association will be shown.

In Fig. 1 will be seen the result of a load test on malleable iron truck wheel. The wheel was supported on a shaft 6¼ inches in diameter, said shaft being supported outside the wheel. The load was applied at the top of the wheel between two spokes. A hardwood block was placed between the compression head and the wheel face. A load of 148,900 pounds was recorded before the casting yielded, when the flanges were bent and the body of the rim showed small cracks as shown in the illustration.

What Malleable Is

The process of making malleable iron castings may be briefly outlined as follows. It consists, first, of melting in an air furnace, open hearth, or electric furnace, a properly proportioned mixture of pig iron, with sprue or scrap castings from some previous heat, and possible additions of steel scrap. The bath is refined until enough silicon has been removed from the iron to force all of the carbon to remain combined in the resultant product and the consequence is that, after the iron has been cast in previously prepared molds, the castings will possess a white fracture with the accompanying hardness and brittleness incident to that condition. Examination of this white or "hard" iron under the microscope reveals the structure shown in Fig. 2. Second, the subjecting of these castings to a heat treatment in suitably designed ovens where they are heated to redness for several days.

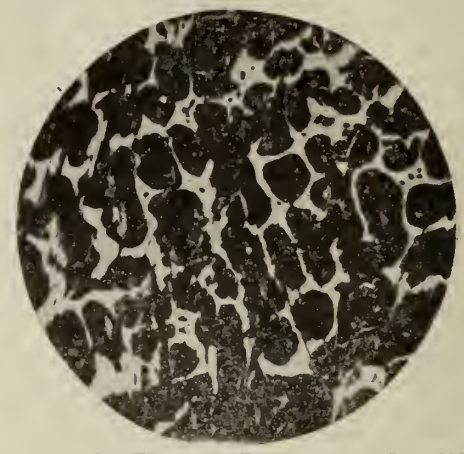

FIG. 2 STRUCTURE OF WHITE HARD IRON UNDER THE MICROSCOPE.

Through this heat treatment, or "annealing," the extremely hard carbide of iron of the white castings is broken up into two very soft constituents, carbonless iron, or ferrite, the most ductile constituent in any iron product, and free carbon. Coincident with this transformation some of the carbon is removed from the castings, both factors serving

(Continued on page 33.)

FIG. 1—RESULT OF LOAD TEST ON MALLEABLE IRON TRUCK WHEEL.

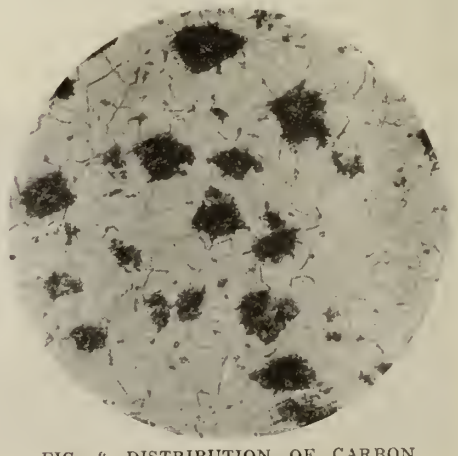

FIG. 3—DISTRIBUTION OF CARBON.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—We are experiencing considerable trouble in our nickel-plating department owing to excessive "pitting" of the work. After having done everything our knowledge could suggest, we, as old subscribers to your publication, beg to request your opinion as to cause and cure of the condition as herein described.

The product being plated is grey iron stove plate. Present process includes electro-cleaning, swabbing, acid dip, scourging and final rinse, then nickeled direct on iron.

One solution yielding pitted deposits is approximately 500 gallons made up from 300 gallons of old double salt solution of 6 degree Beaume, by additions of nickel sulphate, boric acid, magnesium chloride and nickel carbonate. Solution slightly acid, 12 degrees Beaume, and operated at a temperature of 110 degrees Fahr. with one-half the anodes of 98/99 per cent. cast nickel, and one-half rolled anodes, duration of plating is from 45 minutes to one hour. Deposit heavy.

Another solution yielding pitted deposits was made from an 8 degree Beaume double salt solution by addition of some chemicals as mentioned in first bath, excepting that ammonia was used instead of nickel carbonate. Acidity, very slight, 12 degree Beaume, nearly all anodes are pure cast nickel. Temperature of solution during operation, 110 degrees Fahr. Duration of plating, one hour more. Deposit heavy.

We have cleaned everything connected with the baths, boiled and filtered the solutions, added single salts, boric acid, magnesium chloride and carbonate of nickel. The labor is the only thing that gave a temporary relief, but after a day or two the same trouble reappears. We have added about 60 pounds of nickel carbonate to the 500-gallon tank and same proportion to smaller one. Ammonia has bad effect.

We have worked the current from 1.25 volts to 2.5 volts and from 50 amperes to 150 amperes for the big tank and from 35 amperes to 100 amperes for the small ones, without any appreciable difference in the fitting difficulty. What shall we do to correct the condition?

Answer.—Pitting of nickel deposits has annoyed hundreds of good platers and is one of the conditions met with in nickel plating which requires careful consideration when encountered. The two principal causes of pitting are: excessive current density (amperes per unit of cathode surface) and low metal content in combination with excess acid. In your case we believe the latter condition is the source of your trouble. The actual metal content is evidently much less than you imagine. The temporary relief obtained by additions of nickel carbonate indicates a condition which should not occur in a well balanced nickel bath operated as you describe.

We are inclined to believe you have added the various chemicals without due regard to their respective value in the solution and then depended upon the Beaume hydrometer to indicate the metal density. We would impress upon you the uselessness and misleading character of the Beaume hydrometer reading in cases of this kind. As long as a nickel solution consists of nickel salts only and the acidity is kept accurately constant, the Beaume hydrometer serves as a useful guide. In commercial practice the foregoing condition is never met.

The formation of excess acid in the solution or the addition of chemicals alters the accuracy of the hydrometer reading and renders it absolutely useless as a guide toward the maintenance of proper metal content. The only reliable method is analysis. Your solution of 12 degrees Beaume has been constructed by the solution of at least five different chemicals, three of which have in no way added to the metallic strength of the bath, but have helped to boost the Beaume reading and mislead you as to the actual strength of the solution. In fact the conductivity of the solution is really too great for the amount of metal it contains. Excess hydrogen is liberated and pitting results. Furthermore, if the nickel solutions were well balanced and the effective anode surface had been adequate before additions of nickel carbonate were begun, we do not think the solution should be even slightly acid at present with the nickel carbonate in solution and the bath properly operated.

Furthermore, if your anode surface is approximately 50 per cent. rolled nickel and the current strength is actually as low as you mention, the current does not play a very important part in the case. But, if the anode surface consists of too large a percentage of rolled nickel the disintegration of the anode may not take place with sufficient readiness to feed the bath and the solution becomes acid and depleted in metal. This would account for the temporary effect of the additions of nickel carbonate.

We fail to see why you used rolled nickel anodes if you have no difficulty in obtaining good cast anodes of 98 99 per cent. nickel. As you have not mentioned the relative quantities of the various chemicals used in these baths, we can not judge of their respective bearing on the question at issue. However, if your nickel solutions do not contain at least 2 or 3 ounces of boric acid per gallon we would suggest additions to total this amount. Our experience has proven that nickel solutions operated either hot or cold may be very strongly acid to litmus if the metal content is maintained at not less than 2.6 per cent. With this metallic strength and from 2 to 3 ounces boric acid per gallon present, the allowable current density would greatly exceed the figure given in your letter and the output per tank would be increased with no difficulty from either pitting or burning.

Therefore, ascertain the actual metal content of the solutions by analysis for metal. Retard the evolution of hydrogen by use of boric acid, eliminate excess rolled anodes, maintain effective anode surface equal to or exceeding normal cathode surface, discard hydrometer as guide to metal content. Do not force the deposits. Maintain the solution by additions of single nickel salt only. Ascertain whether anodes are actually feeding the solution, if not add more corroding salts.

Question.—Would the addition of cobalt sulphate to our regular nickel bath enable us to produce a harder, firmer deposit at higher current densities than is possible with the pure nickel solution? Our product is a small brass article and our daily output averages ten thouand pieces; we now run these 30 minutes in the nickel bath.

Answer.—The introduction of cobalt sulphate into the nickel solution would increase the metallic strength of the solution in the same manner that nickel sulphate does. The effect of the cobalt as a hardener would be only temporary unless cobalt anodes were used in proportion to percentage of cobalt sulphate in the solution; this fact we believe will be clear to you upon further consideration. The permissible current densities would be higher only so long as the cobalt content of the solution was maintained constant. The prices of cobalt salts and cobalt metal at present practically prohibit the use of cobalt in any form for electro-plating.

Additions of cobalt salts to the nickel bath would have a tendency to darken the color of the deposit and increase the tarnishing qualities to a very marked extent, even though only a small amount were used.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

Laying Out Gearing and Making Gear Patterns

A Treatise on Gearing, Including Spur, Bevel, and Miter Gears, Involute and Epicycloidal Teeth, Circular and Diametral Pitch and Various Other Features in Connection With Gearing

By H. J. M'CASLIN

THE theoretically perfect gear wheel is a friction wheel communicating a smooth, uniform rolling motion by means of frictional contact of its surface. It is, in fact, a gear wheel with a great many very small weak and irregular teeth. Such a gear as this is manifestly imperfect, subject to slip, and on the whole not suitable for many purposes. The whole object of the science of gear wheels is to increase the size and strength of the teeth without destroying the uniformity of the motion transmitted. This is accomplished by so forming the outlines of the teeth that they will produce the desired result. Theoretically, there are an infinite number of curves that will meet the requirements, but only two are of any practical importance or have come into use to any extent. These are the epicycloidal and the involute.

FIG. 1 DEVELOPING THE 15 DEGREE INVOLUTE TOOTH CURVE.

Definitions

The spur gear is one whose teeth are parallel to its axis. It is used for transmitting motion from one shaft to another whose axis is parallel. There is also a class of spur gears called herring bone gears or double helical spur gears in which, while the axes are parallel, the teeth are arranged spirally around the cylindrical surfaces of the gears.

Bevel gears are gears used to transmit motion between shafts at right angles to each other, the shafts being in the same plane. The teeth of the gears must necessarily stand at an angle to the axis.

Mitre gears are bevel gears whose teeth stand at an angle of 45 degrees to the axis and are used to transmit motion between shafts at right angles, in which the number of revolutions of the two shafts is the same.

Angle gears are similar to bevel gears, except that while the shafts intersect they are placed at some other angle to each other than 90 degrees. This angle may be either obtuse or acute.

A hunting tooth gear is a gear into which an extra tooth has been introduced so as to make the number of teeth in the gear and pinion prime to each other so that any two teeth will not come in contact until each tooth in the small gear has been in contact with every tooth in the large gear. This tends to equalize wear on the gears. A hunting tooth may be introduced either into bevel or spur gears.

An internal gear is a spur gear having teeth on the inside of its periphery in place of on the outside and the pinion or smaller gear is situated inside of the large gear. In all internal gear the shapes of the teeth correspond to the spaces in an ordinary spur gear of the same pitch and diameter, with the exception of the fact that the back-lash and clearance are reversed in position.

A rack is a straight bar having gear teeth cut upon it. It may be considered as a gear of infinite radius.

When two gears act upon each other, the greater is termed the gear and the less the pinion.

The word diameter when applied to gears is always understood to mean the pitch diameter. The tooth curves are always developed from the circle which represents the pitch diameter.

Circular pitch is the distance between corresponding points of adjacent teeth measured along the pitch circle and is obtained by dividing the length of the circumference of the pitch circle by the number of teeth in the gear.

Diametrial pitch is the number of teeth in a gear divided by the number of inches in the diameter of the pitch circle. In other words, it is the number of teeth per inch of diameter of the gear.

The thickness of a gear tooth is its thickness measured on a pitch circle.

The space between two gear teeth is space measured on the pitch circle.

The addendum is that part of the tooth outside the pitch circle.

The dedendum, or root, is that part of the tooth inside the pitch circle.

The back-lash is the side clearance between the two teeth in mesh.

The clearance is space between the point of a tooth and the bottom of the space into which the tooth meshes.

The face of a tooth is the working surface from the pitch circle to the point of the tooth.

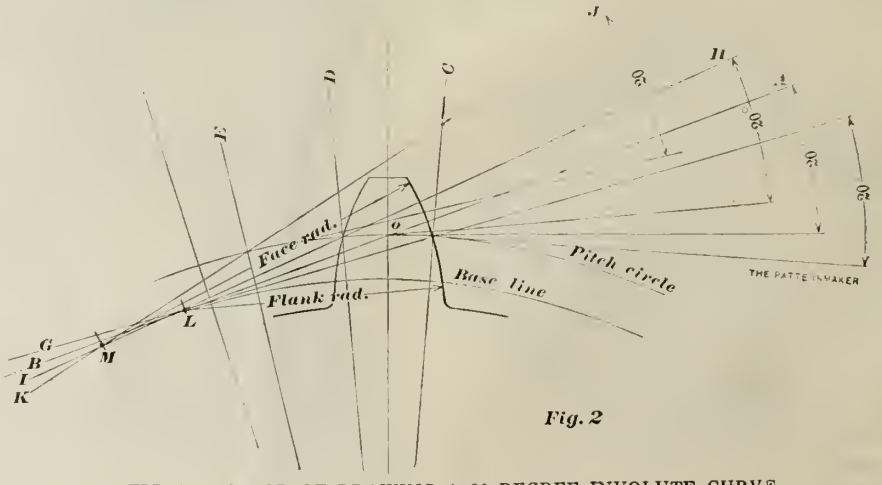

Fig. 2

FIG. 2—METHOD OF DRAWING A 20 DEGREE INVOLUTE CURVE.

The flank of a tooth is the surface from the pitch circle to the root of the tooth.

The length of a tooth is the distance from the root of the tooth to its point.

The pitch point of a tooth curve is the point in which the outline of a tooth intersects the pitch circle.

When two gears are so located that their teeth run together, the gears are said to be in mesh.

Rules

When the circular pitch is given to obtain the diametral pitch, divide 3.1416 by the circular pitch.

When the diametral pitch is given to obtain the circular pitch, divide 3.1116 by the diametral pitch.

When the number of teeth and the circular pitch are given, to obtain the pitch diameter, multiply the circular pitch by the number of teeth and divide the product by 3.1416.

When the number of teeth and the diametral pitch are given to obtain the pitch diameter, divide the number of teeth by the diametral pitch.

When the pitch diameter and the circular pitch are given to obtain the number of teeth, multiply the pitch diameter by 3.1416 and divide by the circular pitch.

When the pitch diameter and the diametral pitch are given to obtain the number of teeth, multiply the pitch diameter by the diametral pitch.

When the pitch diameter and the number of teeth are given to obtain the circular pitch, multiply the pitch diameter by 3.1416 and divide by the number of teeth.

When the pitch diameter and the number of teeth are given to obtain the diametral pitch, divide the number of teeth by the pitch diameter.

Involute Teeth

The involute curve is the curve which would be drawn by a pencil point at the end of a thin band that will not stretch and is drawn tight while being unwound from a cylinder.

The base circle in the involute system of gearing is the circle from which the involute curve that forms the tooth outline is drawn. The base circle is always inside of the pitch circle. The base circle for the 15 degree involute tooth is inside the pitch circle a distance equal to 1-60 of the pitch diameter, and the base circle for the 20 degree involute tooth is inside of the pitch circle by a distance equal to about 3-100 of the diameter of the pitch circle.

Fig. 1 shows the manner of developing or drawing the 15 degree involute tooth curve. A is the pitch point of the pitch circle. The line B-C is drawn at an angle of 15 degrees to a tangent to the pitch circle at the pitch point. The base circle is then drawn tangent to the line B-C. The line B-C is called the line of action, as it is along this line that the gear teeth will be in contact. In laying off a gear tooth any convenient number of points may be stepped off between the pitch point A and the point of tangency of the base circle G. With the dividers set at the same distance succeeding points are stepped off along the base circle as shown at L, K, J, I, H, G, F, E, D, and S. Point S is one point in the tooth curve. Tangents to the base circle should be drawn at the points D, E, F, H, I, J. K, and L and on these tangents distances equal to the arcs which they correspond to should be stepped off. This will give a series of points M, N, O, P, Q, etc., which are points in the desired tooth outline. A smooth curve drawn through these points will represent the outline of the tooth.

An approximate method of drawing a 20 degree involute curve is shown in

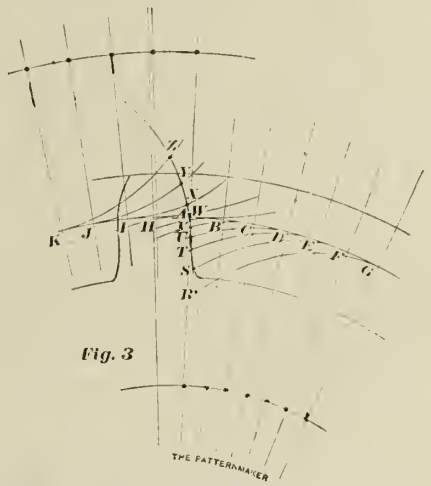

FIG. 3—DRAWING THE EPICYCLOIDAL CURVE.

Fig. 2. The pitch circle should be drawn first and spaced off to correspond with the pitch points. One of the spaces should then be divided, giving the point O, which corresponds to the centre of the tooth on the pitch circle. Through this point draw a radial line and at right angles to it a tangent as shown. From this tangent lay off an angle of 20 degrees and draw the line A-B. Tangent to the line A-B draw the base circle. Also draw the radial lines C. D and E through the pitch points of the teeth. At the pitch point on the line C draw a tangent to the pitch circle, lay off 20 degrees and draw the line F-G. In like manner from the pitch point on the line D draw a tangent, lay off 20 degrees and draw the line H-I and also from the pitch point on the line E draw a tangent, lay off 20 degrees and draw the line J-K. It will be noted that all of these lines pass through a pitch point on the pitch circle and hence are tangent to the base circle. The point L where the lines F-G and H-I intersect will give a centre for the flank radius to use for drawing that portion of the tooth outline between the base circle and the root, and the point M where the lines H-I and J-K intersect will give the centre for the face radius which is used in drawing the portion of the tooth curve outside the base circle. The points L and M will fall very close to the base circle, in fact, close enough so that for all the teeth the centres may be taken on the base circle. By this means, it will be noticed that circular arcs of approximately the same form as the involute curve have been substituted for it.

Drawing the Epicycloidal Curve

An epicycloid is a curve formed by a point on the circumference of the circle as it is being rolled on the outside of another circle while a hypocycloid is a line generated by the point on the circumference of a circle that is being rolled on the inside of another circle.

In the epicycloidal system of gearing the faces of the teeth are formed of epicycloids and the flanks by hyocycloids, as shown in Fig. 3. The complete circles are not drawn in this case, but only short arcs, though the centres for the circles are shown on the radial lines.

The circle rolled upon the other circle to generate the tooth curve is called the circle of action or a generating circle and is rolled upon the pitch circle. In laying off this tooth, the pitch circle, addendum circle and root circle should be drawn first. The pitch circle is then spaced off to correspond with the number of teeth desired. In order to lay off the tooth curves from the pitch point A step off equal divisions on the pitch circle right and left as shown. Through these points radial lines are drawn and from centres upon these radial lines arcs of the circle of action are drawn as shown. In order to determine the points of the tooth curves it is necessary to measure off on these arcs of the generating circle distances corresponding to the portion of the pitch circle which has been rolled over between the point A and the point where the radial line intersects the pitch circle. For instance, to find the point Z, step off the distance from A to K upon the pitch circle with a pair of dividers. Then step off corresponding distances along the generating circle from K to Z, thus obtaining the point Z. The point Y is obtained by stepping off the distances from A to J and back along the generating circle to Y. X and W are obtained in like manner and the points V, U, T, S, and R of the flank curve are in like manner obtained from stepping off distances from the pitch circle to radal lines at B, C, D, E, F, and G and then back along the generating circles to points V, U, T, S and R. After the points are obtained a smooth curve is drawn through them which will represent the desired tooth curve.

Construction work will begin at once on the University of British Columbia. The necessary roads will be built immediately and land clearing on the University site carried out.

Molding and Casting of Bronze Statues

An Interesting Account of the Casting of the Statue "Perseus" by Cellini, Four Centuries Ago—How the Core Was Made First; the Thickness Put on in Wax, Which Was Melted Out After the Mold Was Made

THE subject of statuary will probably appeal to the average man of today as one treating on the ancient history of the foundry business more than as one of real interest to the foundryman of the present generation. On the contrary it will be well to remember that there are more bronze statues being cast at the present time than at any time in the history of the world.

While Canada is not leading in this art, she is nevertheless doing her share. In succeeding issues of the Canadian Foundryman we will endeavor to show some interesting work along this line which is being done in Canada at the present time, but in introducing the subject to our readers we will go back four hundred years and describe in the artist's own words how he succeeded in casting a most difficult statue under most adverse circumstances. The reader will require to follow the story very carefully in order to understand it but he will be abundantly repaid for his trouble. The process consists of first building up the core and shaping it to approximately the shape of the desired casting. This core has a thickness of wax put upon it which is made to the exact design of the "casting to be." The mold is next made, after which the wax is melted out, leaving the space to be filled with bronze. It will be noticed that his worries were not so much about getting the metal into the mold as about getting the air out, and according to his story his fears were realized, the head coming first class and the foot coming defective.

This statue still stands in the Loggia de Lanzi, Florence, Italy, a silent monument to the genius of Benvenuto Cellini, who was born at Florence in the year 1500. The statue was made under the patronage of the Duke de Medici, but the Duke refused to advance any money on it, and in fact lost faith in Cellini's ability to successfully produce the statue. The story, from the Autobiography of Cellini, appeared in the Molders' Journal of November, 1918, and is as follows:

It was as much as the Duke could do to stand by and listen to my pleadings. He kept turning first this way and then that; while I, in despair, poor wretched I, was calling up remembrance of the noble state I held in France, to the great sorrow of my soul. All at once he cried: "Come, tell me, Benvenuto, how is it possible that yonder splendid head of Medusa, so high up there in the grasp of Perseus, should ever come out perfect?" I replied upon the instant: "Look you now, my Lord! If your Excellency possessed that knowledge of the craft which you affirm you have, you would not fear one moment for the splendid head you speak of. There is good reason, on the other hand, to feel uneasy about this right foot, so far below and at a distance from the rest." When he heard these words, the Duke turned, half in anger, to some gentlemen in waiting, and exclaimed: "I verily believe that this Benvenuto prides himself on contradicting everything one says." Then he faced round to me with a touch of mockery, upon which his attendants did the like, and began to speak as follows: "I will listen patiently to any argument you can possibly produce in explanation of your statement, which may convince me of its probability." I said in answer: "I will adduce so sound an argument that your Excellency shall perceive the full force of it." So I began: "You must know, my Lord, that the nature of fire is to ascend, and, therefore, I promise you that Medusa's head will come out famously; but since it is not in the nature of fire to descend, and I must force it downwards six cubits by artificial means, I assure your Excellency upon this most convincing ground of proof that the foot cannot possibly come out. It will, however, be quite easy for me to restore it." "Why, then," said the Duke, "did you not devise it so that the foot should come out as well as you affirm the head will?" I answered: "I must have made a much larger furnace, with a conduit as thick as my leg; and so I might have forced the molten metal by its own weight to descend so far. Now, my pipe, which runs six cubits to the statue's foot, as I have said, is not thicker than two fingers. However, it was not worth the trouble and expense to make a larger; for I shall easily be able to mend what is lacking. But when my mold is more than half full, as I expect, from this middle point upwards, the fire ascending by its natural property, then the heads of Perseus and Medusa will come out admirably; you may be quite sure of it." After I had thus expounded these convincing arguments, together with many more of the same kind, which it would be tedious to set down here, the Duke shook his head and departed without further ceremony.

PERSEUS AND MEDUSA.
In the Loggia de Lanzi, Florence, Italy. Modelled, molded, cast, and finished by Benvenuto Cellini, 1500-1571.

Abandoned thus to my own resources, I took new courage, and banished the sad thoughts which kept recurring to my mind, making me often weep bitter tears of repentance for having left France; for though I did so only to revisit Florence, my sweet birthplace, in order that I might charitably succor my six nieces, this good action, as I well perceived, had been the beginning of my great misfortune. Nevertheless, I felt convinced that when my Perseus was accomplished, all these trials would be turned to high felicity and glorious well-being.

Accordingly I strengthened my heart, and with all the forces of my body and my purse, employing what little money still remained to me, I set to work. First I provided myself with several loads of pinewood from the forests of Serristori, in the neighborhood of Montelupo. While these were on their way, I clothed my Perseus with the clay which I had prepared many months beforehand, in order that it might be duly seasoned. After making its clay tunic (for that is the term used in this art) and properly arming it and fencing it with iron girders, I began to draw the wax out by means of a slow fire. This melted and issued through numerous air-vents I had made; for the more there are of these, the better will the mold fill. When I had finished drawing off the wax, I constructed a funnel-shaped furnace all round the model of my Perseus. It was built of brick, so

interlaced, the one above the other, that numerous apertures were left for the fire to exhale at. Then I began to lay on wood by degrees, and kept it burning two whole days and nights. At length, when all the wax was gone, and the mold was well baked, I set to work at digging the pit in which to sink it. This I performed with scrupulous regard to all rules of art. When I had finished that part of my work, I raised the mold by windlasses and stout ropes to a perpendicular position, and suspending it with the greatest care one cubit above the level of the furnace, so that it hung exactly above the middle of the pit, I next lowered it gently down into the very bottom of the furnace, and had it firmly placed with every possible precaution for its safety. When this delicate operation was accomplished, I began to bank it up with earth I had excavated; and, ever as the earth grew higher, I introduced its proper air-vents, which were little tubes of earthenware, such as folk use for drains and such-like purposes. At length, I felt sure that it was admirably fixed, and that the filling in of the pit and the placing of the air-vents had been properly performed. I also could see that my workpeople understood my method, which differed very considerably from that of all the other masters in the trade. Feeling confident, then, that I could rely upon them, I next turned to my furnace, which I had filled with numerous pigs of copper and other bronze stuff. The pieces were piled according to the laws of art, that is to say, so resting one upon the other that the flames could play freely through them, in order that the metal might heat and liquefy the sooner. At last I called out heartily to set the furnace going. The logs of pine were heaped in, and, what with the unctuous resin of the wood, and the good draught I had given, my furnace worked so well that I was obliged to rush from side to side to keep it going. The labor was more than I could stand; yet I forced myself to strain every nerve and muscle. To increase my anxieties, the workshop took fire, and we were afraid lest the roof should fall upon our heads; while, from the garden, such a storm of wind and rain kept blowing in, that it perceptibly cooled the furnace.

Battling thus with all these untoward circumstances for several hours, and exerting myself beyond even the measure of my powerful constitution, I could at last bear up no longer, and a sudden fever, of the utmost possible intensity, attacked me. I felt absolutely obliged to go and fling myself upon my bed. Sorely against my will having to drag myself away from the spot, I turned to my assistants, about ten or more in all, what with master-founders, hand-workers, country-fellows, and my own special journeymen, among whom was Bernardino Mannellini, of Mugello, my apprentice through several years. To him in particular I spoke: "Look, my dear Bernardino, that you observe the rules which I have taught you; do your best with all despatch, for the metal will soon be fused. You cannot go wrong; these honest men will get the channels ready; you will easily be able to drive back the two plugs with this pair of iron crooks; and I am sure that my mold will fill miraculously. I feel more ill than I ever did in all my life, and verily believe that it will kill me before a few hours are over." Thus, with despair at heart, I left them, and betook myself to bed.

No sooner had I got to bed, than I ordered my serving maids to carry food and wine for all the men into the workshop; at the same time I cried: "I shall not be alive tomorrow." They tried to encourage me, arguing that my illness would pass over, since it came from excessive fatigue. In this way I spent two hours battling with the fever, which steadily increased, and calling out continually: "I feel that I am dying." My housekeeper, who was named Mona Fiore da Castel del Rio, a very notable manager and no less warm-hearted, kept chiding me for my discouragement; but, on the other hand, she paid me every kind attention which was possible. However, the sight of my physical pain and moral dejection so affected her, that, in spite of that brave heart of hers, she could not refrain from shedding tears; and yet, so far as she was able, she took good care I should not see them. While I was thus terribly afflicted, I beheld the figure of a man enter my chamber, twisted in his body into the form of a capital S. He raised a lamentable, doleful voice, like one who announces their last hour to men condemned to die upon the scaffold, and spoke these words: "O Benvenuto! your statue is spoiled, and there is no hope whatever of saving it." No sooner had I heard the shriek of that wretch that I gave a howl which might have been heard from the sphere of flame. Jumping from my bed, I seized my clothes and began to dress. The maids, and my lads, and everyone who came around to help me, got kicks or blows of the fist, while I kept crying out in lamentation: "Ah! traitors! enviers! This is an act of treason, done by malice prepense! But I swear by God that I will sift it to the bottom, and before I die will leave such witness to the world of what I can do as shall make a score of mortals marvel."

When I had got my clothes on, I strode with soul bent on mischief toward the workshop; there I beheld the men, whom I had left erewhile in such high spirits, standing stupefied and downcast. I began at once and spoke: "Up with you! Attend to me! Since you have not been able or willing to obey the directions I gave you, obey me now that I am with you to conduct my work in person. Let no one contradict me, for in cases like this we need the aid of hand and hearing, not of advice." When I had uttered these words,, a certain Maestro Alessandro Lastricati broke silence and said: "Look you, Benvenuto, you are going to attempt an enterprise which the laws of art do not sanction, and which cannot succeed." I turned upon him with such fury and so full of mischief, that he and all the rest of them exclaimed with one voice: "On then! Give orders! We will obey your least commands, so long as life is left in us." I believe they spoke thus feelingly because they thought I must fall shortly dead upon the ground. I went immediately to inspect the furnace, and found that the metal was all curdled; an accident which we express by "being caked." I told two of the hands to cross the road, and fetch from the house of the butcher Capretta a load of young oak-wood, which had lain dry for about a year; this wood had been previously offered me by Madame Ginevra, wife of the said Capretta. So soon as the first armfuls arrived, I began to fill the grate beneath the furnace. Now oak-wood of that kind heats more powerfully than any other sort of tree; and for this reason, where a slow fire is wanted, as in the case of a gun-foundry, alder or pine is preferred. Accordingly, when the logs took fire, oh! how the cake began to stir beneath that awful heat, to glow and sparkle in a blaze! At the same time I kept stirring up the channels, and sent men upon the roof to stop the conflagration, which had gathered force from the increased combustion in the furnace; also I caused boards, carpets and other hangings to be set up against the garden to protect us from the violence of the rain.

When I had thus provided against these several disasters, I roared out first to one man and then to another: "Bring this thing here! Take that thing there!" At this crisis, when the whole gang saw the cake was on the point of melting, they did my bidding, each fellow working with the strength of three. I then ordered half a pig of pewter to be brought, which weighed about sixty pounds, and flung it into the middle of the cake inside the furnace. By this means and by piling on wood and stirring now with pokers and now with iron rods, the curdled mass rapidly began to liquefy. Then, knowing that I had brought the dead to life again, against the firm opinion of those ignoramuses, I felt such vigor fill my veins that all those pains of fever, all those fears of death were forgotton.

All of a sudden an explosion took place, attended by a tremendous flash of flame, as though a thunderbolt had formed and been discharged amongst us. Unwonted and appalling terror astonished every one, and me more even than the rest. When the din was over and the dazzling light extinguished, we began to look each other in the face. Then I discovered that the cap of the furnace had blown up, and the bronze was bubbling over from its source beneath. So I had the mouths of my mold immediately opened, and at the same time drove in the two plugs which kept back the molten metal. But I noticed that it did not flow as rapidly as usual, the reason being probably that the fierce heat of the

fire we kindled had consumed its base alloy. Accordingly I sent for all my pewter platters, porringers and dishes, to the number of some two hundred pieces, and had a portion of them cast, one by one, into the channels, the rest into the furnace. This expedient succeeded, and every one could now perceive that my bronze was in most perfect liquefaction, and my mold was filling; whereupon they all with heartiness and happy cheer assisted and obeyed my bidding, while I, now here, now there, gave orders, helped with my own hands, and cried aloud: "O God!! Thou that by Thy immeasurable power didst rise from the dead, and in Thy glory didst ascend to heaven!" .... even thus in a moment my mold was filled; and seeing my work finished, I fell upon my knees, and with all my heart gave thanks to God.

After all was over, I turned to a plate of salad on a bench there, and ate with hearty appetite, and drank together with the whole crew. Afterwards I retired to bed, healthy and happy, for it was now two hours before morning, and slept as sweetly as though I had never felt a touch of illness. My good housekeeper, without my giving any orders, had prepared a fat capon for my repast. So that, when I rose, about the hour for breakfast, she presented herself with a smiling countenance, and said: "Oh! is that the man who felt that he was dying? Upon my word, I think the blows and kicks you dealt us last night, when you were so enraged, and had that demon in your body as it seemed, must have frightened away your mortal fever! The fever feared that it might catch it too, as we did!" All my poor household, relieved in like measure from anxiety and overwhelming labor, went at once to buy earthen vessels in order to replace the pewter I had cast away. Then we dined together joyfully; nay, I cannot remember a day in my whole life when I dined with greater gladness or a better appetite.

After our meal I received visits from the several men who had assisted me. They exchanged congratulations, and thanked God for our success, saying they had learned and seen things done which other masters judged impossible. I too grew somewhat glorious; and deeming I had shown myself a man of talent, indulged a boastful humor. So I thrust my hand into my purse, and paid them all to their full satisfaction.

That evil fellow, my mortal foe, Messer Pier Francesco Ricci, majordomo of the Duke, took great pains to find out how the affair had gone. In answer to his questions, the two men whom I suspected of having caked my metal for me said I was no man, but of a certainty some powerful devil, since I had accomplished what no craft of the art could do; indeed they did not believe a mere ordinary fiend could work such miracles as I in other ways had shown. They exaggerated the whole affair so much, possibly in order to excuse their own part in it, that the major-domo wrote an account to the Duke, who was then in Pisa, far more marvellous and full of thrilling incidents than what they had narrated.

After I had let my statue cool for two whole days, I began to uncover it by slow degrees. The first thing I found was that the head of Medusa had come out most admirably, thanks to the air-vents; for, as I had told the Duke, it is the nature of fire to ascend. Upon advancing farther, I discovered that the other head, that, namely, of Perseus, had succeeded no less admirably; and this astonished me far more, because it is at a considerably lower level than that of the Medusa. Now the mouths of the mold were placed above the head of Perseus and behind his shoulders; and I found that all the bronze my furnace contained had been exhausted in the head of this figure. It was a miracle to observe that not one fragment remained in the orifice of the channel, and that nothing was wanting to the statue. In my great astonishment I seemed to see in this the hand of God arranging and controlling all.

I went on uncovering the statue with success, and ascertained that everything had come out in perfect order, until I reached the foot of the right leg on which the statue rests. There the heel itself was formed, and going farther, I found the foot apparently complete. This gave me great joy on the one side, but was half unwelcome to me on the other, merely because I had told the Duke that it could not come out. However, when I reached the end, it appeared that the toes and a little piece above them were unfinished, so that about half the foot was wanting. Although I knew that this would add a trifle to my labor, I was very well pleased, because I could now prove to the Duke how well I understood my business. It is true that far more of the foot than I expected had been perfectly formed; the reason of this was that from causes I have recently described the bronze was hotter than our rules of art prescribe; also that I had been obliged to supplement the alloy with my pewter cups and platters, which no one else, I think, had ever done before.

Having now ascertained how successfully my work had been accomplished I lost no time in hurrying to Pisa, where I found the Duke. He gave me a most gracious reception, as did also the Duchess; and although the majordomo had informed them of the whole proceedings, their Excellencies deemed my performance for more stupendous and astonishing when they heard the tale from my own mouth. When I arrived at the foot of Perseus, and said it had not come out perfect, just as I previously warned his Excellency, I saw an expression of wonder pass over his face, while he related to the Duchess how I had predicted this beforehand. Observing the princes to be so well disposed towards me, I begged leave from the Duke to go to Rome. He granted it in most obliging terms, and bade me return as soon as possible to complete his Perseus; giving me letters of recommendation meanwhile to his ambassador, Averardo Serristori. We were then in the first years of Pope Giulio de Monti.*

*Elected Pope, February, 1550.

BRASS FOUNDRY MOLDING

Molding Machines Used For Jobbing Work by Vickers, Ltd.

Molding machinery for jobbing work is successfully used in the brass foundry of Vickers, Ltd., Barrow-in-Furness, England, according to H. B. Weeks in a paper read before the recent meeting of the Institute of Metals. The output of jobbing work treated in molding machines has been, he says, 75 per cent. higher than when made on the floor.

The pattern plate is provided with means for indicating the correct position that each pattern is to occupy thereon, such as a series of openings or dowel holes. The dowel holes may have index numbers and be located at predetermined distances apart over the surfaces of the pattern plate. The patterns may be provided with means for indicating the correct position which they are to occupy on the pattern plate, such as two or more openings or dowel holes for receiving the dowel pins which secure the patterns in position on the pattern plate.

Patent rights for this pattern plate were taken out some time ago by Vickers, Ltd.

In the Vickers brass foundry about 80 tons of brass castings were turned out per week. From August, 1914, to November, 1918, two million brass castings were shipped. Some idea of the proportions of the company's war program may be realized by the statement that at one period well over 1,200 castings were shipped each day for seven days a week.

The metal-melting plant consists of two 7-ton and one 5-ton reverberatory furnaces, and 44 crucible fires, the total capacity being 42 tons per day metal output.

The furnaces are charged in part with briquets, which are compressed by hydraulic pressure, and which are composed of turnings and borings of every description and form of brass.

Among special alloys was a "high-strength brass" of the 60 : 40 type containing 2 per cent of nickel and about 3 per cent. of manganese, formerly called manganese bronze. The tests from sand-castings gave 15 tons (33,500 lb.) per square inch yield, 32-36 tons (71,500 to 80,500 lb.) per square inch tensile with not less than 15 per cent. elongation on 2 inches. This material was somewhat pale in color, however, which was the cause of further experiments being made to produce a bronze of richer tone. Although this was successfully accomplished, it became increasingly difficult to meet the Government demands for higher strength and yield point without

resorting to artificial cooling of the test-bar.

Recognizing that such tests did not represent any portion of the casting, other mixtures were experimented with until one was obtained which fulfilled all the Admiralty requirements from a bar cut from any part of the casting. There is now no difficulty, Mr. Weeks claimed, in obtaining from such a casting 20 tons per square inch yield, 40 tons per square inch ultimate tensile, and 20 per cent. elongation on 2 inches.

Another special alloy manufactured, known as Vickers Crown metal, which has the appearance of German silver, has been found of value in cases where resistance to corrosion is essential. This also has a yield of 20 tons per square inch, an ultimate tensile of not less than 35 tons per square inch, with about 10 per cent. elongation on 2 inches. This proved of utmost service for parts of submarines and their engine fittings.

The quantity of castings made during the five years covering the war period was as follows:

Total output of castings from brass foundry, 16,886 gross tons; largest casting 23½ gross tons; smallest casting, 1 ounce; total average rejections for the five years, 3 per cent.

SOMETHING ABOUT PHOSPHORUS

Phosphorus is something which should be of interest to readers of foundry literature, and while some knowledge of it is of actual benefit there are other things which may be said about it which will be exercise for the brain and will be interesting knowledge to carry around. When we speak of phosphor bronze, or specify how much phosphorus there is in our iron, we speak as though we were acquainted with it, and when we speak of hypophosphates as a medicine or talk of eating fish in order to strengthen our brain development through the action of the high phosphorus content of the fish, we speak of it as though it were a familiar subject. Yet what is this phosphorus? It is not a metal and it is not an earth nor an acid nor a liquid. Our brain and our system in general would be useless without it, yet it is a deadly poison. Phosphorus is one of the elements of nature which seems to have many uses and which is allied with a great many different materials. In chemistry it is designated by the symbol P; and its atomic weight=31. It is a non-metallic pentacl* element. It is found in a state of combination in the unstratified rocks, in the soil, in the organism of plants, and in the bodies of animals, including the human body. It was discovered by Brandt in 1669. It is prepared from powdered calcined bones by treating them with two-thirds of their weight of sulphuric acid diluted with water, evaporating the liquid portion, and, after mixing with charcoal, desiccating by heating in an iron vessel. The dry mass is then introduced into a stone retort, heated, and the phosphorus which is evolved is collected under water. It resembles imperfectly bleached wax, is soft and flexible at common temperatures. Its specific gravity is 1.77; vapor density, 4.35. It melts at 42.2 deg. C., and boils at 287 deg. C. On cooling it, it sometimes forms dodecahedral (twelve sided) crystals. It is insoluble in water, and is kept in that liquid, but dissolves in native naphtha and bisulphide of carbon. It is very inflammable and will take fire from the heat of the hand. In fact it will take fire from the heat of the atmosphere unless the thermometer is below 111 deg. Fah.

Amorphous Phosphorus

A remarkable modification exists under the name of amorphous phosphorus, prepared by exposing common phosphorus to 250 deg. C. for 50 hours. It will then be a reddish-brown infusible substance, insoluble even in bisulphide of carbon; specific gravity 2.1. It is not luminous in the dark, but can be reconverted into ordinary phosphorus by heating it to 260 deg. It is used on a very large scale in the preparation of safety matches.

Canton's Phosphorus

A white amorphous substance known as calcium sulphide, but frequently referred to as Canton's phosphorus, from John Canton, F.R.S. (1718-1772), an electrician and physicist, is obtained by heating in a close vessel a mixture of three parts oyster shells and one part sublimed sulphur. It is luminous in the dark, and is used for lettering clock dials, match cases or anything which is to be visible in the dark.

Phosphorus in the Foundry

Phosphorus may be beneficial or harmful to cast iron, depending upon the amount used and the purpose for which the iron is intended. There is usually from a quarter of one per cent. to one one per cent. as it makes the iron cold, short and brittle, and by prolonging the time of cooling gives the lighter sections of the castings a better chance to bleed the heavier sections.

Another feature in connection with phosphorus is that on heavy sections as the outside cools it forces the phosphorus toward the centre and when the casting is all cooled the heart is preponderatingly phosphorus and of inferior quality. All things considered, it is not advisable to allow the phosphorus to exceed .7 or .8 per cent except in the case of extremely thin ornamental castings.

Phosphorus in the Brass Foundry

In copper-tin alloys phosphorus is a decided benefit to the casting as it is one of the best of deoxidizers and has a tendency to harden the casting. For formal bearings it has exceptional value, as it prevents oxide spots, which are fatal to good bearings, and having a hard, clean surface it makes an easy running durable bearing. For castings which are to be subjected to high temperature it is not to be recommended as a high temperature weakens it.

In castings where zinc forms part of the alloy phosphorus should not be used, as phosphorus and zinc work against each other and spoil the good effects of both and produce unsound castings.

*Pentacl, in chemistry, is a name given to those elements which can directly unite with or replace five atoms of hydrogen, chlorine, or other monatomic element. The chief pentacls are nitrogen, phosphorus, arsenic, antimony, and bismuth.

BRINGS OUT A SAFETY MASK

Stratford Man's Idea Has Been Approved of by Several Associations

Stratford.—An invention by J. Welsby, 17 St. Vincent Street, has just been made known. It is a protector for the face for iron and steel polishers. It is a mask which fits over the face, and is in the form of a screen. Iron wires run across and copper wires up and down. These are magnetized, and to them all minute particles of steel are attracted, and thus kept from entering the eyes. The invention has been endorsed by the National Safety Association of Chicago, and will be endorsed, it is said, by the International Metal Polishers' Association of Canada.

WHAT IS MALLEABLE IRON

(Continued from page 26)

to convert the hardest possible product into one which is soft yet very tenacious.

We see, then, that the process consists of a refining operation followed by a heat treatment, and, when properly carried out, gives us a product consisting wholly of ferrite containing more or less free carbon, the carbon being uniformly distributed throughout the area of the section, as may be seen in Fig. 3.

It is a process founded on well-known laws of metallurgy and, while its success presupposes a knowledge of metal mixtures and proper temperatures, still, the ancient veil of mystery which was drawn over the operations of the average malleable iron foundry no longer exists. Like mixtures of iron or any other materials subjected to like thermal conditions must react in the same manner. It cannot be otherwise, and once the underlying principles are determined and properly applied, the success of any organization in the production of good malleable iron castings is directly proportional to the determination to succeed.

The Frost & Wood Co., Ltd., Smith's Falls, Ont., is in the market for a 10-h.p., General Electric or Westinghouse motor, 60 cycle, three-phase, 440 volts, 1,200 r.p.m.

CANADIAN FOUNDRYMAN
METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal Industries

B. G. NEWTON, Manager A. R. KENNEDY, Managing Editor F. H. BELL, Editor

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The New Year

THE new year is now with us and is prepared to deliver the same allowance of prosperity as every New Year brings, providing we are prepared to accept it, and the onus is with ourselves to make conditions what we would have them. If we assume an attitude of pessimism we can be assured of a spell of hard times, but if, on the other hand, we make up our minds that things are going to flourish, there is nothing to prevent them from flourishing. There is, of course, never any occasion to be extravagant or wasteful, but at the same time there is no occasion to be exceptionally penurious just now any more than any other time. If we will continue to make our regular purchases, keeping within the limit of our ability to pay cash, the money will be kept in circulation and times will automatically be normal. There have been no bad crops and no over-production; in fact there has been nothing to make times anything but reasonably busy with, of course, a gradual trend towards normal.

Editorial Programme

DURING the year 1921 it will be the aim of our editorial department to supply the readers of Canadian Foundryman with a complete programme of foundry material in each issue. As everyone knows, there are more departments in connection with a foundry than with almost any other line of business and it will be our aim to cover every department at every issue, so that if a reader is particularly interested in any subject he will always be able to find that subject treated upon. Each subject will occupy approximately the same position in each issue, making it easily located.

The subject matter for 1921 will always contain an illustrated description of a new Canadian foundry. In this manner we propose to show our readers that new foundries are being built in Canada, and by adhering to our established record of sticking strictly to actual facts we hope to show that the class of foundries being built is second to nothing in the world.

Another feature which we hope will be of interest will be a rudimentary course for students, but not necessarily for apprentices only, as there are many practical men who have never been taught the rudiments of the trade. Few apprentices have been taught why hard ramming affects a mold as it does and few foundrymen seem to know why scrap iron is different from pig iron. Many little points like these have been neglected, but if looked into would save many a dollar.

Beginning with February issue we will describe, each month, some particular article of foundry equipment in order to impress upon the mind of the progressive foundryman the advisability of equipping his foundry with the most modern equipment. Our new equipment section will also be supplied with the latest inventions in foundry equipment.

Our working man's department and our questions and answers department will always be well taken care of, and no pains will be spared in our endeavor to be of service to those who are in need of assistance. The condensed news items which we have published under the heading of "The Foundry Scrap Pile," will continue to be an interesting page, while pattern making, plating and polishing, malleable cast iron, melting and mixing of iron, steel and nonferrous metals will continue to receive the same degree of attention which has always characterized them.

All told, we trust that our efforts to produce a really acceptable foundry paper will be such as will not only permit us to retain our present numerous subscription list, but to gather in any which we may have missed. The contents of this issue are published on page 64 and will, we think, be of interest to the reader. The contents of the next issue will contain a description and several photographic views of the interior of the new Anthes foundry at Winnipeg, in which are installed one mile of overhead conveyor track, making it one of the best-appointed foundries on the continent. In the molders' section we will show the mold and the cores in their various stages for a piece of electrical machinery and which it is said will be the largest grey iron casting ever made in Canada. This casting will be poured within the next thirty days. In the brass foundry section we will show the process of molding bronze statuary in one of Canada's leading statuary foundries, being a line which few Canadians realize exists in Canada, but which is in a flourishing state. Our special article will be on cranes and conveyors, in which we will endeavor to demonstrate the different methods of handling material in the foundry. All the other departments will be well taken care of.

Soviet and Capitalist

SOVIET and Bolshevik are names which to the ordinary man have the same meaning. Neither name yet appears in the English dictionary, so we will have to conclude that they, like camouflage and some other words, were products of the war, coined purposely to suit positions which

the war had created or made possible of creation. While they do not appear in the dictionary they probably will ere long and will be described as an organization whose aim is to combat the capitalist.

When we consider the conditions which existed in some of the European countries, where every acre of land, practically every particle of wealth and every vestige of authority was in the hands of a select few, it was quite reasonable to see why those outside of the circle and who had no possible chance to improve their condition should not let an opportunity slip when such an opportunity was offered to reverse the order of things. If they went about it in a rough-shod way and if they carried their power beyond the limits of civilization, we might attribute it to lack of education which the capitalist denied them. Had they been permitted, as every Canadian is, to have a "say" in the management of affairs and been shown some reward which would have been theirs as a result of thrift, it is doubtful if the thought of the capitalist would have crossed their minds. As it was, they did the only thing which they could see to do.

In Canada no such conditions ever existed as formerly existed over there and no excuse can be offered for wanting such conditions to exist here as are being tolerated over them, yet it is a distressing fact that there are a few native born Canadians who do not hesitate to express themselves as being in favor of introducing bolshevism into Canada in order to exterminate the capitalist. What they would do after the capitalist was gone is hard to figure out. The same laws govern all classes and many of our most successful business men spring from very humble birth, demonstrating that there is nothing to prevent the man who is not satisfied from putting forward a little effort and becoming something of a success. If he has not the ability to succeed and is prepared to admit that the other fellow was born with superior intelligence, he would find the same obstacles in his way under any form of government. If there is anything wrong with our laws the would-be bolshevik has the same chance as anyone else on election day and if he cannot win out at the polls he may depend on it that he has not sufficient support to win out elsewhere.

But to get back to the capitalist. Why does any one wish to put a damper on the success of those who are ambitious to succeed? And what advantage would it be to any of us to reduce the well-to-do to a state of penury? It takes a lot of different kinds of people to make up a world and we cannot spare the capitalist as easily as we could spare some of the others. There are times when he is a most essential citizen. Large projects calling for millions of dollars could not be carried on without some capable men in control, and men capable of controlling such projects would not be bothered with them if there was nothing in it but a living the same as the laborer has, and if the capable man is brought to the same status as the laborer, who is going to engineer the construction of large bridges and steamships, etc., to say nothing of financing them? All told, it is difficult to see how anything better than we have can be devised, and now that we are beginning a new year it is to be hoped that each one will endeavor to be satisfied and try to build himself up instead of continually striving to pull others down.

Exchange Rate Again

THE exchange rate is again at a point where it is causing serious thinking, during the past few days it having touched 15 per cent. on several occasions. It is not an uncommon thing to hear of buyers asking for the longest possible period of time in which to settle for shipments from United States, not because they have not the means to make payment, but because they hope for a better turn in the exchange situation; and the gaining of a few points will mean quite an item to them.

Others, again, have been fooled by doing this thing. They have held off to the last, hoping for a more favorable rate, only to find that instead of coming down the rate of exchange has been going up, and that each day delayed has cost them more money instead of saving them a few dollars as they had hoped.

On Bein' the Boss

IN years when things was movin' fast and cash was stalking 'round, when clinkin' dimes and nickels was an ordinary sound—I used to think in them there days before we felt a pinch, that bein' the boss around the place was one outstandin' cinch.

Why, say, we never worried much, things seemed to hump along, with everything a-breakin' right and nothing ever goin' wrong.

His golf friends came in after lunch to coax him from the scene, to go and whack the little pill and clod-hop on the green. He gave his orders right and left, by heck, it was a cinch, this job of bossin' on the works before we felt the pinch.

And I looked forward to the day when they would pussyfoot to me, and say, "young man, this job of boss is henceforth handed unto thee."

Ah, then I would sit down in ease, a rift of wisdom on my brow, I'd keep an auto and a farm, a bacon hog, likewise a cow. My feet I'd plant upon the desk, my wealth would prosper inch by inch—oh, bossin' the whole shootin'-match would be to me a pleasant cinch.

But since things aint so fresh just now as they was 'bout three months ago, I'm not so certain of the fun of bein' the boss around the show. Some funny things turn up these days between the mornin' and the night, and I hear them tellin' round the plant that money's gettin' powerful tight.

The boss aint quittin' early now, he's settin' tight around the place, they're stickin' grey hairs in his head and plantin' wrinkles in his face. There's papers piled upon the desk, enough to fill a good-sized cart, and he's figurin' this here thing and that, and squintin' hard upon a chart. He's sittin' there long after dark, and says we aint a-goin to bust, but he's puttin' on the pressure there and changin' off from may to must.

I use to think that bossin' job was one grand, easy, fat affair, but I aint a-hankerin' for them now to lead me forward to his chair.—Ark.

KEEP GOING!

"Motor World."

Goderich, Ont.—The C. H. Epps Mfg. Co., Ltd., has been incorporated with a capital stock of $40,000 by C. H. Epps, Lawrence Usher, Harry Everett and others. The company will manufacture engines and machinery.

Toronto.—See & Smith Motors, Ltd., have been incorporated to manufacture engines, motors, machinery, automobiles, trucks, accessories, etc., with a capital of $260,000 by James S. Beatty, 10 Adelaide Street East, John R. Rumball, 65 Charles Street West, and others.

Montreal Foundry for Sale—The plant of the Williams Mfg. Co., Ltd., St. James Street, Montreal, is in liquidation and will be offered for sale. It consists, in addition to the machine shop, carpenter and smith shops, of a foundry 70 by 176 and a two-story office. The plant is completely equipped and is in operation at the present time.

The Whiting Foundry Equipment Co., Harvey, Illinois, announces that it has changed its name to Whiting Corporation, increasing its authorized capital stock from $700,000 to $3,000,000. The Whiting Corporation remains under the same management and will continue the manufacture of cranes, foundry equipment and railway specialties as heretofore.

Another Foundry for Hull, Quebec.—Robert E. Murphy, of Ottawa, Ont., in company with A. O. Archimbault and John Elliott, has organized a company with a capital stock of $50,000 to be known as the Murphy Pressure Flushing Trap Co., Ltd. The company will build and operate an iron and brass foundry at Hull, Que.

Wright Manufacturing Company, Lisbon, Ohio, U.S.A., are distributing their Hoist Catalogue No. 10, a forty-seven page, profusely illustrated, book on the subject of hoists. The descriptive matter covers about everything which could be said on the subject, while the illustrations show the different types of hoist working on lines of work for which they are most suited. Several of the views are of familiar foundry scenes. In addition several tables and price lists are given together with internal mechanism of the hoists. The capacities of hoists shown range from five hundred pounds to thirty tons.

Toronto.—Canada Heaters, Ltd., have been incorporated to manufacture stoves, furnaces, boilers, hot water heaters, etc., by Robert E. L. Lott, 371 Roxton Road, Leo Pheland, 72 Queen Street West, and others, with a capital of $100,000.

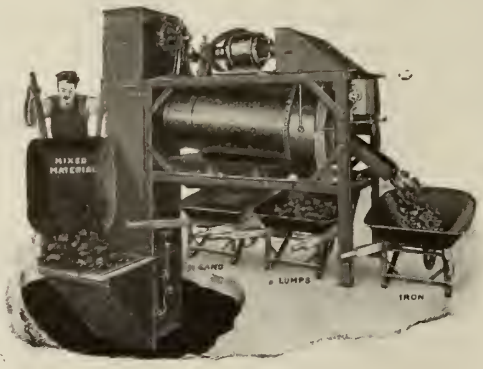
The LaSalle Lead Products, Ltd., is the name of a concern which has recently been incorporated at Windsor, Ont., with a capital of $40,000 to manufacture lead, brass, copper and other metal products. The promoters are Joseph E. Bensette and France Dennis.

Windsor, Ont.—Burroughs Machines, Ltd., is the name of a company which has recently been incorporated in this city by S. E. Wedd, Roy B. Whitehead, B. V. McCrimmon and others, with a capital of $1,000,000, to manufacture adding machines.

Toronto.—A company has been incorporated in this city to manufacture metal toys and certain lines of tools and machinery. The chief promoters are Benjamin Luxenburg, 268 Palmerston Ave., and John R. Huffman, 648 Shaw Street. The company is capitalized at $40,000 and will be known as Fairy Toys, Ltd.

A CORRECTION

In the December issue of Canadian Foundryman in connection with the advertisement for the Dominion Foundry Supply Co. a ladle cut was used instead



MAGNETIC SEPARATOR.

of an engraving illustrating the magnetic separator manufactured by the Magnetic Mfg. Co., of Milwaukee, Wis., who are represented in Canada by the Dominion Foundry Supply Co. The correct illustration is here shown.

Formerly Supply Manufacturer Shot.—Friends of Mr. Sly, president of the W. W. Sly Mfg. Co., Cleveland, Ohio, will regret to learn that in company with his accountant he was travelling by automobile from the bank to his place of business with several thousand dollars with which to pay the hands, when they were held up by thugs and shot. The thugs escaped with the money and have not yet been apprehended.

Proposed Merger Called Off.—The American Foundry Equipment Company, 366 Madison Ave., New York City, who announced some time ago their intention to amalgamate with the Whiting Equipment Company under the name of "Whiting Corporation," now advise that the merger has not taken place, and negotiations to that end have been discontinued. The company will continue to do business as the American Foundry Equipment Company.

George O. Vair who for many years held the position of foundry foreman at the R. McDougal works, Galt, but who has of late been employed in a similar capacity at Stirling, Illinois, was a welcome visitor at Canadian Foundryman sanctum this week. He reports business as slack in his neighborhood. G. O. V. is a periodical contributor to Canadian Foundryman editorial columns and has as usual left us some valuable manuscript for publication in our next issue.

Mack Mfg. Co., Ltd., Extensions.—At the annual stockholders' meeting of the Mack Manufacturing Co., Ltd., of Houston, Texas, the capital stock was raised from $500,000 to $2,000,000, the extra capital to be used to build additions and install more equipment in their modern reinforced concrete plant at Houston, which consists of a large foundry, both steel and gray iron, a well appointed forge shop and machine shop, where are manufactured a most up-to-date line of oil field supplies.

A branch factory modern in every respect is also to be built in either northern Texas or Oklahoma, probably Dallas, Texas, for the manufacture of cable tool equipment;.

J. O. Mack is the president and general manager; H. L. Sadler, secretary; Chas. R. Edwards, plant superintendent.

Fire at Black Donald Graphite Works.—Fire recently destroyed the packing house of the Black Diamond Graphite Co., Limited, Calabogie, Ont. The company has mines some fourteen miles from the town where the graphite is ground and the different grades separated from each other when it is drawn into the town and stored in the packing house. The graphite being refractory would not be damaged to any great extent by the fire but would be contaminated with ashes and debris, making it necessary to draw it all back to the mine and treat it with crude material from the mine. The company has not definitely decided on plans for the new structure but will give the matter consideration in the spring. The loss on building and contents is estimated at $40,000, partly covered by insurance.

Foundry re-opened in Toronto.—The pipe foundry formerly operated by the Canada Foundry Company, Davenport Road, Toronto, but which has been idle for considerable time, has been re-opened by the Canadian Allis-Chalmers Company and entirely remodelled. Pipes will no longer be made; the pits being filled and the floor leveled and cemented. The company will utilize this foundry in the production of small castings, requiring a different grade of iron from that used in making the heavy castings such as are turned out of their large foundry on the opposite side of the street. The building which is 100x150 feet and of exceptional height is of brick construction and in first-class condition. The company, which is affiliated with the Canadian General Electric Co., will in addition to the enormous electrical machinery which they have always been equipped for, manufacture electrical machinery from the largest down to the very smallest which is made, and it is for the small work that the new foundry is utilized. Two cupolas bricked to 60-inches are in position but only one will be used and this is bricked down to 36-inches. Several "Rapid" moulding machines and a pair of McDougall rumblers have been installed to take care of the class of work which is now to be made. Mr. James J. Hickey, who has had wide foundry experience including sixteen years as superintendent with the Gurney Foundry Co., is in charge.

WANTS CASTINGS FOR AUTOMOBILE PISTONS

A subscriber has sent us the following letter which speaks for itself and which should be encouragement to some enterprising foundryman to embark in this line, if it is not already specialized in by any Canadian foundry:

"Can you tell us if there is any foundry in Canada making a specialty of pistons for automobile repairs? We are regrinding automobile cylinders and will require over-size pistons for the different makes. Any information you can give us will be appreciated."

OBITUARY

John Francis Nellis, vice-president of the Charles C. Kawin Company, Chicago and Toronto, died Friday, December 10, at his home 6538 Greenview Ave., Chicago, after an illness lasting only five days. His death was hastened by a slight stroke together with his general low vitality due to Bright's disease and

JOHN FRANCIS NELLIS

continued untiring devotion to his duties. (Age 54 years, 6 months).

From early boyhood until his death Mr. Nellis has been connected with the foundry industry, working in almost every capacity from helper to superintendent and during all this time he never missed an opportunity to help improve the conditions of his fellow workers. During his twenty odd years in connection with the Kawin Company he has been a student and advocate of methods and practices designed to lessen the uncertainties of moulding and reduce the amount of labor necessary to produce the given quantity of castings.

Letters and telegrams of condolence, profuse floral offerings from widely separated points and various local organizations, and the attendance at his funeral of foundry officials from local and out of town shops, together with his relatives, friends, lodge members and business associates, attest the high esteem in which he was held by all who knew him intimately. It can be truthfully said that the foundry industry has lost one of its untiring and devoted members.

Foundry Equipment Men Slain.—Wilfred C. Sly and George K. Fanner, president and vice-president of the W.. W. Sly Mfg. Co., Cleveland, Ohio, manufacturers of foundry tumbling barrels, cinder mills, sandblast machinery, cupolas, core ovens and other foundry equipment, while bringing the company's pay envelopes containing $4,200 to the works in an automobile were held up by thugs and shot dead. The thugs, after securing the money, made their escape and have not vet been apprehended.

READJUSTING WAGES FAIRLY

From Iron Age

During the war period union labor, by striking and by resort to other methods, took full advantage of its opportunity not only to advance wages and reduce hours of labor but also to extend union organization, even in the face of mutual pledges of employers and union leaders to maintain the pre-war status of closed and open shops. Now that many lines of business are depressed and unemployment is increasing, employers might be disposed to retaliate; but it is gratifying to know that as a rule they have aimed to be fair in bringing about readjustments of wages.

One of our correspondents calls attention to the action of a Western machine tool builder who recently found it necessary to curtail his working force materially and reduce the wages of those not laid off. After the number of employees was cut down by laying off the less competent men, the cases of the remaining workmen were taken up individually. Each employee was called into the office and the situation was put to him substantially as follows:

"For a long time the wage market has been high. You have been given the market price for your labor, and conseqquently have enjoyed the benefit of high wages; but now the wage market is lower and you should not expect to be paid above the market price for your labor. Men are coming to our employment office every day anxious to take your place at lower pay than you are receiving. It is only fair to you that you be given the first chance and be allowed to retain your present job at the present market price for the labor you are performing."

When the matter was presented in this way, the employees admitted the reasonableness of the wage reduction and accepted it. In working out new rates, the company did not make a flat cut, but attempted to remove some of the inequalities that had existed, the aim being to come to a basis representing a 20 per cent. reduction from the labor costs that had long existed.

Most men mean to be fair, and in times of slack business radical labor agitators have little influence. What is more important, however, than the readjustment of wage rates is that workmen agree to remove the restrictions upon output which have been a crying evil in the period now drawing to a close. Tactful and fair-minded handling of the problem by employers in these transition months will not only meet the economic requirements of the situation, but will go far toward establishing good will as the basis of future relations, admittedly the greatest of all needs at this time.

Students' Course on Foundry Practice—Sand

Chemical Analysis, Shape and Size of Grain, Difference Between Molding Sand and Core Sand, Pure Sand and Pure Clay Are White and Refractory

By F. H. BELL

IN introducing to the reader the subject of sand, I realize that it will at first appear dry and uninteresting, but if carefully followed it will be found to contain much valuable material for study and much information which will be of real use to the foundryman. The history of sand, while to some extent interesting, is of secondary consideration, but its nature and the various uses to which it can be put, particularly in the foundry, are of vital importance, and it is on this phase of the subject that I will endeavor to interest the reader.

The presence of sand in and about the foundry has become such a familiar sight that special thought is seldom given to it.

Of course the foundryman knows that molding sand and core sand are different, and he also knows that there are sands which are not adapted to either purpose, and he has certain tests to which they must be put before being accepted.

Usual Test for Molding Sand

The usual test to which a sample of molding sand is put is to take a handful and pinch it into a hard lump the width of the hand and then hold it between the thumb and finger. If it does not break in two it is considered to be strong enough, and if it shows all the impressions of the palm of the hand it is considered as good molding sand. To this a certain amount of further consideration is given in order to have a coarse-grained sand for heavy castings and a finer-grained sand for lighter castings. This about covers the requirements for green sand.

For dry-sand work a sand with more bond is preferred, but if such is not available, bonding material of some kind is added.

For loam work, coarse open sand with a high percentage of bond is required.

For core work any sand which has no clay or other foreign matter in it is considered all right and a binder is introduced which holds the core together when it is baked.

Now this is the regular programme in almost every foundry and it fills the bill in a fairly satisfactory manner, but certainly if a little more study were given to the subject a lot of trouble could be avoided. No mold should ever cut, wash, drop out, or kick when being poured. No casting should ever be scabbed and no core should ever blow.

These things would never happen if we all knew as much as we should know and then were in a position to have everything as we want it. Of course I am not prepared to say that I have a panacea for all these ills but I think that if we study what is available on the subject we can put the foundryman in better position to judge the merits and demerits of the various sands with which he comes in contact. The main feature in connection with sand to be used in foundry work is for it to be as nearly fireproof as possible. Other important features are the size and shape of the grain.

Before going into details on these features it is well to remember that there are two distinct substances in the soil which constitutes the surface of the earth, viz., sand and clay, known technically as silica and alumina. Any soil which is not sand or clay is a combination of both, with usually some foreign material such as iron oxide and various alkalies in combination. The theory of sand's origin is that the earth was once a mass of molten rock which gradually cooled until a crust was formed on the surface. This crust, in time, became exposed to the action of rain and frost with the result that particles would become chipped off the rock and washed down the streams. In connection with this hypothesis it is to be presumed that the material of which the rock was formed contained both sand and clay and as the two were being washed by the water, the sand being the heaviest settled to the bottom and the clay either settled on top of it or was washed further along before coming to a position of rest. It will be interesting to note that both sand and clay are white and that both are practically proof against the action of heat. Most foreign material which is in combination with the sand or clay and which changes its color also detracts from its refractory or fireproof qualities. Following the same trend of thought it will be seen that the sand which came to a state of rest soon after being separated from the parent rock will be ragged or sharp cornered, while that which has been washed about on sea beaches and similar places will be worn smooth and almost spherical in shape. It will thus be seen that we have sharp sand, dull sand and clay, all from the same source, in addition to sand of every mesh from dust up to coarse gravel. As we have pointed out all other soil is a combination of different ingredients. Molding sand is simply a combination of sand and clay with a small amount of other matter, but this will be treated in our next lesson.

As we have seen, sand to be used in foundry work of any kind must be heat resisting (usually termed refractory) in order to resist the action of the molten metal, but this is far from being its only requirement. It is not possible to secure a perfectly refractory sand, so we must protect it as much as we can against the action of the metal. When the metal comes in contact with the sand, combustion invariably takes place to some extent, causing gas and smoke, and if it is a green-sand mold steam will also be created. All of this has to escape, and unless the arrangement of the grains of sand and the binder are such as will permit of its escape an explosion of more or less magnitude will be the result. If one grain of sand at the surface of the mold is so confined that the gas formed back of it cannot escape, that grain of sand will in all probability be loosened in order to facilitate the escape of the gas. If the plumbago on the face of the mold prevents the grain from escaping, it cannot prevent its entire surface on all sides from being exposed to the heat, which will melt it, causing it to force its way through the plumbago and become fused to the casting, where it will leave a white speck after being scraped off with the file. From this it will be seen why molds made without the plumbago facing will usually have little lumps on the lower face of the casting and a dirty face on the top.

The wash of the metal over the face of the mold also tends to loosen the grains of sand unless some means has been provided for preventing it from doing so. It will thus be seen that bond is required to prevent the sand from washing, yet this bond is what closes up the spaces between the grains of sand and prevents the escape of the gas. Such being the case, the bond is an important study. As the natural bond in molding sand is so radically different from the artificial bond in core sand we will treat them as separate subjects but as a preliminary I would say that for green-sand molding I prefer a loam with sharp sand as a base and for core sand a round smooth grained sand for a great many of the most difficult kinds of core. I know this last clause will meet with disapproval by many core makers and I might add that it would have met with my own disapproval not so long ago, but I think if the reader will follow me closely and will forget his former prejudices he will agree with me that the advocates of round, smooth sand are correct.

Core makers usually look for the sharpest kind of sharp sand while molding sand experts seem to put most stress on the size of the grain, and as a second in importance the amount of bond, but the shape of the grain and the chemical

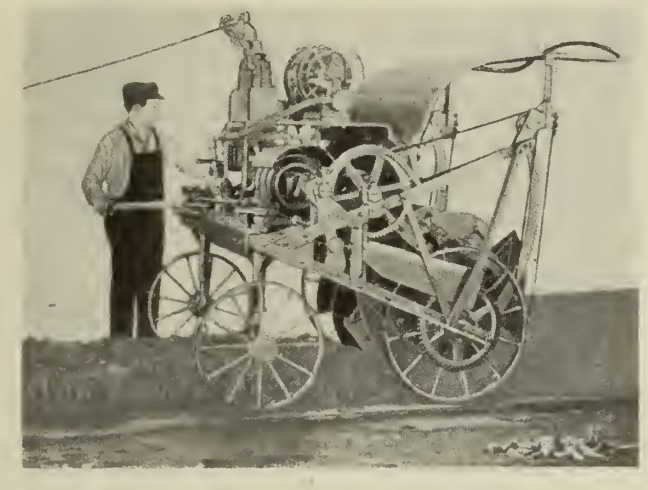
Continued on page 39

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

THE AUTO SAND-CUTTING MACHINE

The American Foundry Equipment Company, 366 Madison avenue, New York City, are putting on the market a novel device in the way of a machine for cutting over sand heaps. As shown in the illustration, it is a combination of spiral blades revolving on an axle in a similar manner to those of a lawn mower, but being right and left, and converging towards the center. The machine is motor-driven and straddles over the sand. When a sand heap is to be cut over the machine is put at one end of the floor and is automatically driven over the sand. As the machine moves along, the blades revolve and break up the lumps, thoroughly mix the sand and pile it up in a long windrow the same as a molder would do with a shovel, but more uniform in temper. If desired to have the sand in a pile against the wall the machine can be run over the heap as often as required until the sand is back far enough. The sand is not thrown at the heap, but is thrown about four feet into the air and falls on the pile in the form of dust. The machine is known as the Auto Sand-Cutter and is made in two types; the traction type as shown in the illustration and the crane type, which is suspended from the shop crane and which is especially adapted to situations difficult to reach with the regular machine.



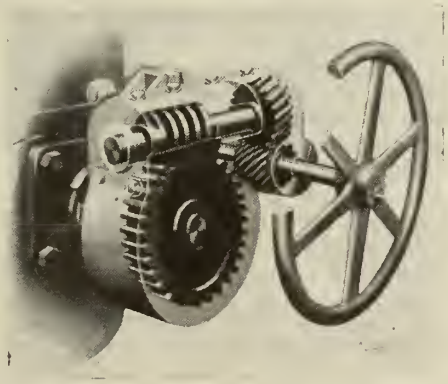
THE MODERN METHOD OF CUTTING UP THE SAND HEAP.

NEW HELICAL WORM GEARED CRANE LADLE

The Whiting Foundry Equipment Co., Harvey, Illinois, is putting on the market a new and interesting helical worm geared crane ladle, which embodies some features which are a decided departure from the regular run of geared ladles.

The distinguishing feature of this new ladle design is the fact that the gearing is mounted on the trunnion instead of on the bail. Consequently any distortion of the bail or bowl will not interfere with the alignment of the gears. The manner in which the gear bracket engages the bail is clearly illustrated in photo herewith. A further advantage of this arrangement is that the gear alignment is not affected by wear on the trunnion journals.

This gear combination, as illustrated in accompanying phantom view, has the self-locking feature of worm gearing but by virtue of the balanced thrust obtained through the helical gears, and the efficiency of this gearing being much higher than that of the ordinary worm gearing, the power required to rotate is considerably less. The helical gear on the hand wheel shaft meshes with a helical gear on the worm shaft. The worm shaft is placed at an angle so that the worm will properly mesh with the large straight-toothed gear keyed to the trunnion. The large straight-toothed gear is of cast steel; the worm and helical gears are forged steel. All gears have machine cut teeth. The construction of the gear case is such that it will accommodate several different ratios of helical gears, depending on the speeds desired. This new style gearing is completely enclosed in dust-proof cover, yet is readily accessible for inspection. Small oil cups with spring caps provide ample lubrication.



COVER REMOVED TO SHOW MECHANISM.

STUDENTS' COURSE OF FOUNDRY PRACTICE

(Continued from page 38)

analysis are not considered. While in the main they are correct, I think it will be quite possible to show that to depend on the instructions given in the general run of text-books on the subject the foundryman will be misled. In a foundry at Brantford I found them using two brands of sand which they secured locally. One was coarse grained and very rich in alumina, while the other was fine and weak in bond. The latter was used on the snap benches and the former on the floors. Yet that fine sand would peel from heavy castings while the coarse sand which was being used on the floors would leave the castings looking like grindstones. The fine sand would have done fairly well on ordinary floor work, while the coarse sand, which would have been excellent for loam or dry sand, was not suited for green sand work of any kind. At a foundry in London I found them using expensive imported sand on green-sand work, and the castings were badly scabbed. The sand would have produced splendid dry-sand work.

In our next lesson we will show drawings and photographs of how the grains of sand lie together when in a mold, how the gas penetrates it and how molding sand mixes through core sand.

The Welland Yards. — The Welland Telegraph, in a recent issue, said:

The British-American Shipbuilding Company is practically no more as far as Welland is concerned. Its doors have been closed and the activities of one of Welland's foremost industries are at an end. On Saturday afternoon the stern section of the "Canadian Squatter" left the shipyard and passed down the canal on its way to the Canadian Vickers Shipbuilding Yards at Montreal. The bow section left Wednesday of last week. This is the last boat that will be built by the British-American Shipbuilding Co. The loss of such a splendid industry is a serious one for Welland, but hopes are entertained that the plant, which is for sale, will be purchased. It is rumored that a prospective buyer is the Chicago Bridge & Iron Company, of Bridgeburg.

The Oxy-Acetylene Welder in the Iron Foundry

Dealing with the Oxy-Acetylene Operator in Connection With the Foundry—How the Welder Can Save and Make Money for the Foundry, Together With Detailed Instructions for Doing Several Classes of Work

By DAVID BAXTER

IN the preceding articles concerning the utility of the oxy-acetylene welding torch in the iron foundry we discussed ways and means of salvaging castings that were hopelessly defective before the advent of the wonder-working little flame; castings that were immediately consigned to the junk pile in days before the torch welder came into his own. Junked because there was no known way to repair the damaged castings.

We discussed two forms of defective castings that are quite common in all iron foundries that do a general jobbing business, viz., the cracked casting and the casting having a slag-hole or spot. Each of these defects causes a great loss to the foundrymen even now; a loss of time, money, and wasted material. There are still many foundries where they do not realize what can be done with the torch. And, no doubt, some who are entirely ignorant of its powers.

Of the "show me" kind the welding torch is unafraid; it is the "blind-who-will-not-see" that are the worst obstacle to this modern money saver. The show me kind will be easily converted because they admit the truth when they see it. While the purposely blind are often convinced only by proof akin to the kick of a mule. However, their prejudices bother us but little, since it is they who mus stand their own losses; in classical words: it is their funeral.

The defects discussed in the previous series are not the only ones that are quite common. There are several other causes for junking new castings; castings that are perfectly good except for one flaw; castings that it is a shame to junk on account of the one defect; castings that need not be sent to the scrap pile if the foundry possesses an oxy-acetylene welding apparatus, and a torch operator with the average human ingenuity.

I have almost unlimited faith in the welder's ability to "figure out a way" to do any kind of welding job. There are many uses for a welding plant, even in the little backwoods foundry. But since we can discuss but one of them in one short article we must perforce take them one at a time.

One of the common causes of defective castings is known in the foundry vernacular as "mis-run" or "cold-shut" castings. This defect is usually caused by the melted iron being too dull, or "dead"; in other words not fluid enough to run properly. The molten metal will spread out over the surface of the mould in rivulets and sheets but the edges of some of these will not join to become one mass. Instead they will congeal or set without uniting. And often they will set before they touch each other. Where the edges touch without flowing together a cold-shut is formed. Where the casting is only partially run or where the molten metal fails to meet, leaving a hole in the casting, it is termed a mis-run. In some cases the defects may be called either a cold-shut or a mis-run. Either of these defects often cause the casting to be rejected. Or rather, did before the oxy-acetylene torch was invented. But now it is a different matter for nearly all cold-shut castings may be remedied by the welding process. And a great many mis-run castings may be saved from relegation to the scrap pile. The wise foundryman is salvaging a large per cent. of his cold-shut and mis-run castings.

Both of the defects are caused by other things than dull metal being introduced into the mold. Sometimes the mold is too wet or too hard which causes the melted iron to boil and bubble in the mold, resulting in cold-shuts due to premature congealing of the molten metal. Sometimes the mold sags or is clamped too tight, thus causing a thin place. Sometimes the ingredients of the molding material are too strong, or are out of proportion, thus causing a disturbance in the mold, resulting in a cold-shut. Sometimes the effect of the ingredients is to chill or set the molten metal which also results in mis-run castings.

Of course there are some castings that are so cheap that it would be a waste of money to attempt to remedy the defect with the torch, except in unusual cases where the element of time saved would justify the cost of welding. But on the other hand the repairing of one large casting may pay interest on money invested in a welding plant.

Such castings as stove parts, small wheels, locks, etc., probably cannot be welded economically. But there is undoubtedly an infinite variety of smaller classes of work that can be arranged to weld economically. Especially those of brass and aluminum, which are usually a part of the jobbing foundry's production. Nearly all of the jobbing iron foundries have a brass and aluminum department which is another field of endeavor for the torch welder. He can reclaim many defective castings of brass and aluminum. These castings are subject to cold-shuts and mis-runs as much if not more than cast iron. And, though the process may be slightly different the castings may be reclaimed as simply and easily as those of cast iron. It is only necessary to make such changes as are usually required for welding such metals.

The work of welding castings having the defects mentioned above is about the same as for the usual run of welding shop business. The cold-shut casting is handled about as we would handle a cracked casting. That is, the welder makes about the same preparation previous to welding as he would for a similar casting with a crack in the place of a cold-shut. In fact a cold-shut is in effect a crack.

He should clean and groove the cold-shut the same as he would a crack, the extent and depth of the groove being governed by the thickness of the iron. He should choose the torch and welding tip size for the same reasons that he would for a cracked casting. The flame is regulated and manipulated the same for a cold-shut as for a crack.

The welder must also exercise the same care and judgement in regard to heating the casting previous to welding as he would for a cracked job. The expansion and contraction should be regulated or controlled for a new casting just as much as for an old one. Then after the job is welded he must use the same care in cooling; contraction should act slowly and evenly to prevent inner strains or open cracks.

In fact all of the different parts of the welding process are practically the same for a new casting as for an old one; it is neither harder nor easier to do the welding. Of course the welder must "use his head" to devise the handiest ways of handling the castings; the quickest and best method of preparing the job; the cheapest, safest method of preheating; in fact any of the numerous little things that are always influenced to a large extent by shop conditions and the ability and temperament of the men employed.

Now in order to take care of the different phases of the welder's work the foundryman should provide at least two torches for the average jobbing shop; one large and one small; each with a complete accompaniment of tips. The operator is not then forced to depend upon one torch for all classes of welding; nor is he forced to "fight" it in event of a "bucking spell," or lose a weld if something happens to the torch.

Next, the welding hose should be a kind constructed especially for rough usage, the dragging over sharp edges, the tender mercies of hob-nails, the constant abrasion of sand and grit so plentiful

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in a foundry; and last but not least the careless neglect of foundry laborers; all of these things and more should be considered when purchasing welding hose for foundry usage. The metal-armored or reinforced kind will probably be the best in the long run.

The rest of the torch equipment should be selected with an eye to ruggedness; such as regulators, gauges, valves, etc., always remembering that a foundry is a place where strong, heavy-handed men work.

It is scarcely necessary to say that the oxygen and acetylene drums should be mounted on a truck to facilitate their handling. This truck should be staunch and easily moveable and should also be so constructed as to be difficult to upset, preferably a two-wheeled truck with chains or straps for holding the tanks in place.

With this portable outfit the welder may work in any part of the establishment, thus eliminating a lot of costly handling of heavy castings, since the welder can nearly always go to the job a lot cheaper than the job can be taken to him. In this connection it might be well to suggest that the welder should try his hand at repairing some of the castings while they are still red hot in the mold. He may thus be able to eliminate preheating and re-heating the casting being already fully expanded and naturally arranged for slow cooling. All that will be needed will be to remove part of the dry moulding sand in the vicinity of the defect, exposing the bare metal; the dry sand to be replaced immediately after the weld is finished.

The idea will not operate on all kinds of castings, nor is it always possible to tell this far in advance whether or not the casting is defective. However, there are probably enough opportunities along this line to make it worth trying; since it is mostly small castings where it is impracticable that the foundryman may brand it as wasteful. The medium weight jobs, such as pipes or columns are more readily inspected and arranged for welding while still hot. But it may not be well to advise the practice for general use, except where conditions warrant.

To illustrate the saving effected by the oxy-acetylene torch in the line of repairing mis-run castings let us take the instance of a cast iron pipe with a cold-shut caused by the molten metal not flowing together at the side of the mold, which might be due to either one of the several reasons given. The reason is of little moment, however, since we are chiefly concerned with the remedy.

First the entire length of the defect, which, as has been stated, is in effect a crack, was cut out in the usual manner to form a V-groove the full length, and depth of metal thickness, the normal metal thickness of this part of the pipe being five-eighths of an inch.

The grooving was handily accomplished with a diamond point chisel by first cutting a small groove then enlarging it to proper proportions. The proportions of the finished groove being a full metal thickness for depth, and twice as wide at the top as the metal thickness. Neither end of the groove ended abruptly but gradually sloped off into the solid casting; this for the purpose of preventing chance of any part of the cold-shut being poorly connected in welding.

During the grooving process the burned moulding sand was carefully removed from the vicinity of the defect. This for the purpose of preventing any of it from entering the weld in the form of melted slag. Care was also taken to remove as much of the sand as possible from the inner side of the pipe; this is often an unknown source of trouble for the torch operator.

After cleaning and grooving the next step in the process was the preheating. This heating previous to welding was in order that the casting in the immediate neighborhood of the weld might be nearly expanded in full before the intense heat of the welding flame was applied. Had the flame been applied while the job was cold the result would undoubtedly have been one or more checks or cracks, due to the difference in expansion and contraction of the melted metal and cold metal of the pipe.

Then, too, the job was heated previously to welding in order to facilitate the fusion of the weld; since hot metal will naturally melt quicker and easier than cold metal. But only a section of the pipe extending about a foot on each side of the groove was heated. In other words only about two feet of the pipe was preheated.

The heating was done with two burners of an air-pressure kerosene preheater, one being placed on either side of the pipe. The flame of one was directed so it would strike the pipe and pass over it, the other being so directed as to throw its flame beneath the pipe. In this way the whole section of the casting was enveloped in a preheating flame, which tended to bring the heat up evenly.

To enclose the preheater and its flame an oven like structure of fire brick was built on each side of the pipe, no attempt being made to seal the joints in the wall. Over the top of this brick device were spread several pieces of asbestos paper to further confine and conserve the heat.

No attempt was made to move the casting; it was repaired where it happened to rest when the welder was ready for it, which further proves the worth of a portable plant.

As soon as the brick-work was ready the oil burners were lighted and permitted to burn under cover until the casting within the walls heated to a dull red; this required in the neighborhood of an hour.

A medium sized welding torch producing a neutral flame was used to make the weld, in connection with a soft iron filler rod three-eighths of an inch in diameter, the fusion of the filler rod being assisted by a patent flux powder applied by dipping the melting end of a filler rod in a pot of it at frequent intervals during the welding.

When the job was sufficiently preheated a part of the asbestos paper directly over the defective portion of the pipe was removed. Immediately the neutral welding flame was brought down in contact with one end of the red hot groove where it was moved back and forth in short arcs until the bottom of the groove melted together. Then the filler rod was brought into play. The flame being passed up and down about an inch of it, alternately swinging across the melting groove to keep it in readiness for the filler which was added as soon as it started to melt.

The operator was careful not to permit the filler metal to drip into the weld since it would tend to cause a poorly connected weld, or at least the danger of a burned portion due to the necessity of remelting the filler which had been slightly cooled in its passage through the air. A drop of but a fraction of an inch will often do great harm to a weld.

The melting filler was introduced to the weld by literally pushing the end of it into the molten bath; as fast as it feeds into the weld more filler is added by a deft manipulation of the flame. Simultaneously with the feeding in of the new metal the flame was gradually worked toward an unmelted portion of the groove in order to prepare it for the coming weld. As fast as one inch of the groove was filled another was ready to receive the new metal.

Thus the entire length of the groove was filled in a succession of inches closely connected. In fact each inch was but a continuation of the preceding ones. As each part of the weld was made the metal was twisted and churned to thoroughly mix it with the melting groove. And, while filling the groove the torch operator was careful to see that the sides as well as the bottom were in a molten condition before adding the new metal. Upon this depended much of the success of the welding process, since there would have been poorly connected parts in the weld if the new metal had been added to unmelted spots. When the last part of the groove had been filled the asbestos paper covering was replaced over the weld to prevent cold air from striking the weld. The oil preheaters, which had been burning during the entire welding, were then turned out, and the pipe allowed to cool before removing the brick oven.

As soon as the pipe inside of the oven was sufficiently cool the brick-work was removed to expose a pipe almost as good as though it had been cast perfectly in the first place. Little finishing was required except here and there a small amount of chipping.

The above described job is but one illustrative of the many mis-run castings which the oxy-acetylene welder stands ready to save for the progressive foundryman, whether he be a specialist or a general jobbing man.

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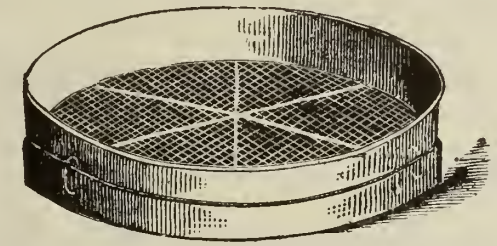

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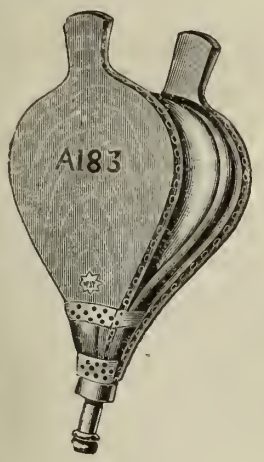

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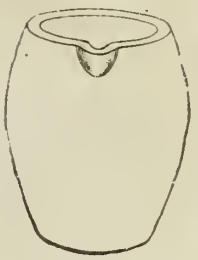

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Lake Superior charcoal, Chicago	53.50
Standard low phosphorus, Phila.	44.75
Basic, Valley furnace	37.50
Bessemer, Pittsburgh	41.90

Canadian Foundry Pig—

	Mont.	Tor.
No. 1	44.90	43.60
No. 2	43.50	42.25

NEW METALS

	Mont.	Tor.
Lake copper	$19.00	$19.50
Electro copper	18.50	19.00
Casting copper	18.00	19.00
Tin	44.00	46.00
Zinc	8.50	9.00
Lead	7.50	8.00
Antimony	8.00	9.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$10.50	$10.50
Copper, crucible	13.00	12.00
Copper, heavy	12.50	12.00
Copper, wire	12.50	12.00
No. 1 mach. comp.	13.00	12.00
New brass cuttings	7.00	9.00
Red brass cuttings	10.00	10.00
Yellow brass cuttings	7.00	7.50
Light brass	5.00	5.00
Medium brass	6.50	6.00
Scrap zinc	5.00	5.50
Heavy lead	5.25	5.60
Tea lead	2.50	3.00
Aluminum	16.00	16.00
	Per gross ton	
Heavy melting steel	18.00	23.00
Boiler plate	11.00	12.00
Axles (wrought iron)	25.00	20.00
Rails	18.00	18.00
Malleable scrap	20.00	25.00
No. 1 mach. cast iron	32.00	33.00
Pipe, wrought	8.50	10.00
Car wheels	30.00	33.00
Steel axles	20.00	20.00
Machine shop turnings	8.00	9.00
Stove plate	23.00	25.00
Cast borings	8.00	12.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04¾
Acid, nitric	.11
Acid, sulphuric	.04½
Ammonia, aqua	.15¾
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.16
Copper, carbonate, anhy.	.41
Copper, sulphate	.13
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.20
Potassium sulphide (substitute)	.40
Silver chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite, per cwt.	9.00
Sodium phosphate	.15
Tin Chloride	.30
Zinc Chloride C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

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Polishing wheels, felt	$4.50
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.08¾
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09½
Crocus composition	.12
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Prices per lb.

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Bars, ½ to 2-in.	$35.00	$37.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	40.00	44.00
Copper sheet, tinned, 14x 60, 14-oz.	43.00	46.00
Copper sheet, planished, 16 oz. base	47.00	50.00
Braziers', in sheets, 6x4 base	39.00	42.00

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	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$10.50	$14.50
Sheets, 3½ lbs. sq. ft.	10.25	14.00
Sheets, 4 to 6 lbs. sq. ft.	10.00	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

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	Mont.	Tor.
Sheets, black, No 28	$ 8.50	$ 9.00
Sheets, black, No. 10	7.00	7.50
Can. plates, dull, 53 sheets	13.00	13.00
Can. plates, all bright	14.00	14.00
Queen's Head, 28 B.W.G.	13.50	....
Fleur-de-Lis, 28 B.W.G.	12.50	....
Zinc sheets	16.50	20.00

PITTSBURGH LETTER

In view of the fact that there is not likely to be any general buying movement in steel products in the near future, say not earlier than three months hence, steel manufacturers would prefer it to be assumed that present prices represent the prospective bottom, but the fact may as well be stated plainly that this is not the more likely prospect. The balance of probabilities is that the low point in steel prices, on which the market will eventually turn and from which it will stiffen, will be lower than the present level, say from 2.00c to 2.20c for bars, shapes and plates. If such prices come, they will not be developed soon. There is no incentive for a mill to name such close prices unless, or until, it sees an opportunity to fill up fairly well and thus obtain an economical operation.

As to wages, reductions by independents' mills have not been proceeding nearly as fast as seemed likely two or three weeks ago. The majority of independents are holding off, awaiting a further reduction in the cost of living and also being desirous that the present plant idleness may have its full moral effect both upon workmen and the retail stores they patronize. Some mills, too, attach much importance to the theory that immediately upon wage reductions being made steel buyers would expect lower prices for steel.

At the opening of business this week a large valley pig iron producer announced its willingness to sell basic iron at $30 and Bessemer iron at $32, valley, thus recording declines of $3 in each grade from the previous nominal quotations. Foundry iron, formerly quotable at $35, valley, is not plainly marked at any price, but will have to readjust itself to no more than a moderate spread above basic.

Prospects for Consumption

Obviously it is a question of when the ultimate consumer will take hold. It is not a question directly of when the fabricating shops, car shops, machinery manufacturers, bolt, rivet and nut makers, spike manufacturers, agricultural implement makers, producers of cold finished steel bars, and the various other "manufacturing consumers" will decide to buy steel from the mills, but a question when the customers of these steel consumers will themselves be disposed to buy. The manufacturing consumers will buy only as they see a market for their various finished products.

The readjustment the country is now undergoing is of course chiefly a readjustment in prices for materials and services. Consequently it is not enough for mill prices of rolled steel products to be readjusted. There must be readjustment in prices all along the line down to the ultimate consumer. Assuming for the sake of argument that mill prices have been readjusted adequately, it is a fact that prices of manufactured goods have not in all cases been readjusted in keeping. The manufacturing consumer cannot stand between the steel mill and the public and put in his own pocket the reduction the steel mill makes. To illustrate, at the top of the last price movement before the war, culminating late in 1912, steel bars reached 1.40c, while standard railroad spikes reached 1.85c. Merchant bars, as now equalized between the Steel Corporation and independents, are 2.35c, which is 67 per cent. advance.

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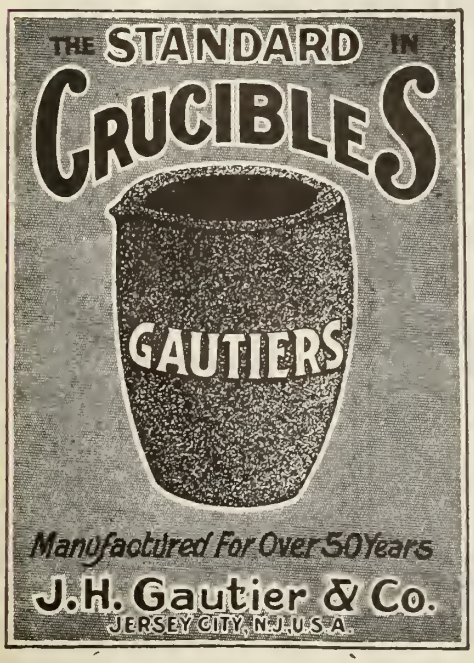

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CARE OF MACHINES

Continued from page 24

ment. He is to have immediate access to the facilities of the machine shop to help him keep the equipment in repair. Moreover, McArthur, you are to arrange some sort of a plan whereby all machine equipment in the foundry is inspected regularly. I believe that if we follow out a systematic plan of checking up this equipment and repairing it before it is too late, we shall increase the amount of work which we get out of our machines. Let's try this plan, say for six months, and at the end of that time I believe that the results will be apparent to all of us."

The foregoing conversation took place something over a year ago in a well-known foundry and machine shop. The plan outlined by Mr. Smith at this little luncheon was put in force that same afternoon. Mr. Smith and Mr. McArthur, the foundry superintendent, secured an old millwright from the machine shop who fitted in with the new job almost perfectly. He took pride in keeping the equipment in good shape and before long was boasting of the small amount of lost time caused by foundry machinery breaking down. The result soon was apparent in the smoother working of the various departments in the foundry and McArthur had the pleasure of seeing his suggestion carried out under favorable conditions.

Williams, who had taken only a lukewarm interest in the proposition at first, soon became enthusiastic over it, especially as his monthly report showed that the charges formerly appearing under the title "Repairs to Foundry Machines" constantly decreased. In other words, the millwright was more than saving his wages by cutting down the cost of repairs. This was due, no doubt, to the fact that his systematic inspection of various machinery enabled him to correct small defects before extensive repairs were necessary.

The conditions outlined in the above story are typical of those prevailing in many plants in the United States. Many foundrymen have modern equipment but are not getting adequate return for their money simply because they are not utilizing this equipment advantageously. Foundry equipment must be cared for just as conscientiously as the machine tools in the machine shop and as soon as foundrymen break away from the traditional methods of the oldtime foundry and realize that a molding machine should receive as much attention as a drill press or engine lathe, their maintenance troubles will cease. The writer recommends that foundrymen who are having trouble in maintaining their machine equipment follow the example of Mr. Smith and for a trial period of at least six months, allow a reliable mechanic to take the responsibility of keeping the machinery in repair. If this plan is carried out intelligently no progressive foundryman will return to his old slipshod methods at the end of the six-month period.

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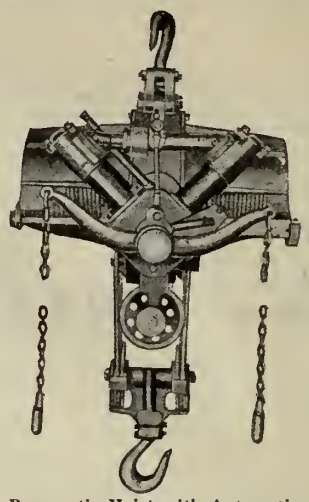

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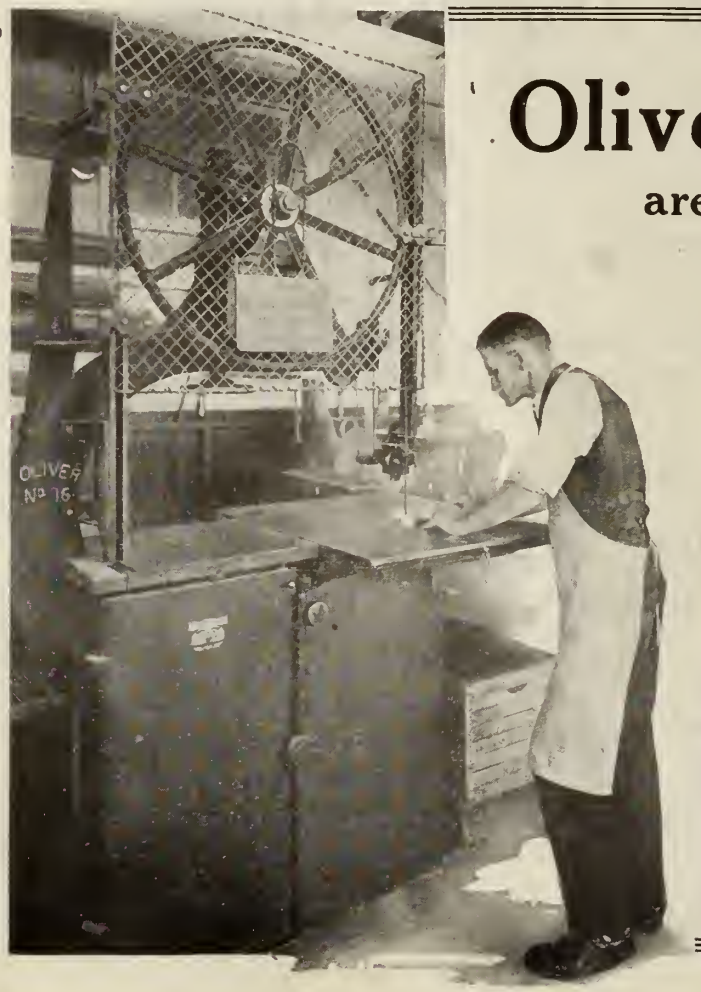

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The Rt. Hon. Arthur Meighen, Prime Minister of Canada, has written for January 1st MACLEAN'S a forceful exposition of his platform and policy.

HE discusses the bilingual issue, the tariff, reconstruction, the growing unrest and unemployment — but he avers that the tariff is the "one great issue of our domestic politics."

"Why is it the issue?" queries Mr. Meighen. "It is the issue, I think, because the enemies of the Government cannot oppose us on any other."

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Articles by Mr. W. L. Mackenzie King and Mr. T. A. Crerar will follow in succeeding issues.

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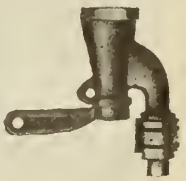

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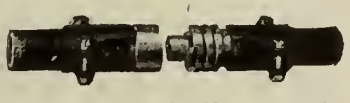

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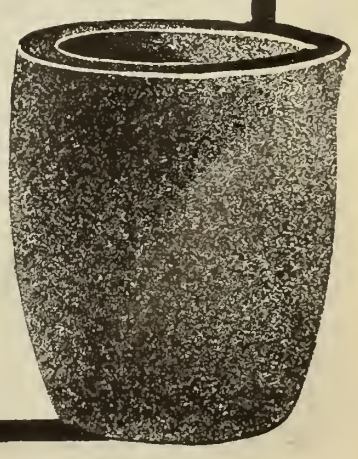

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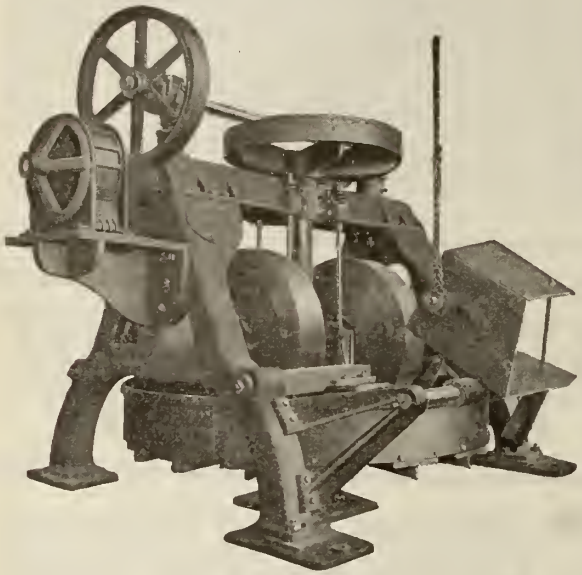

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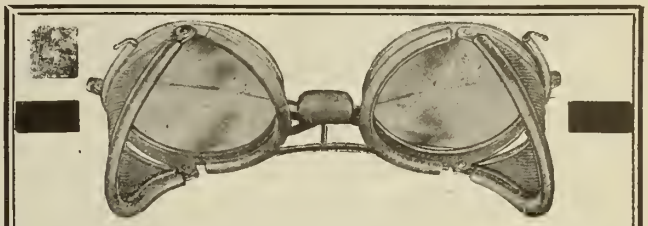

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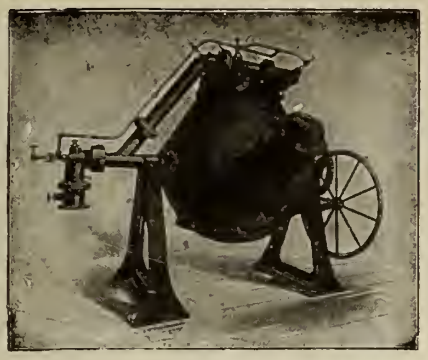

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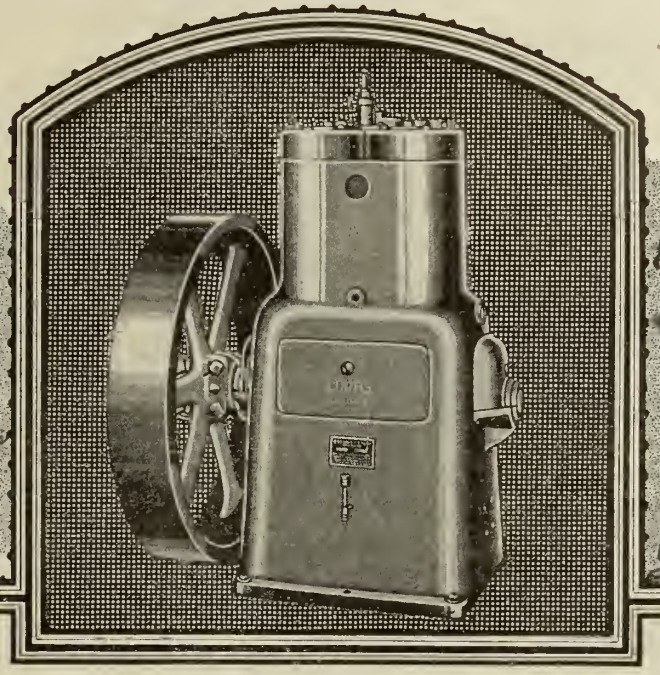

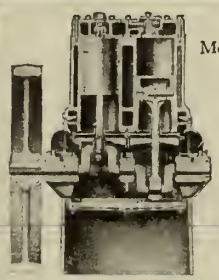

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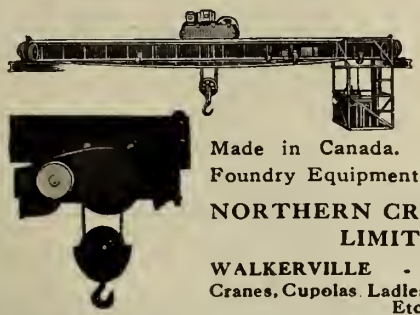

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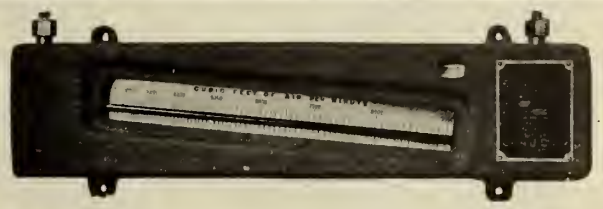

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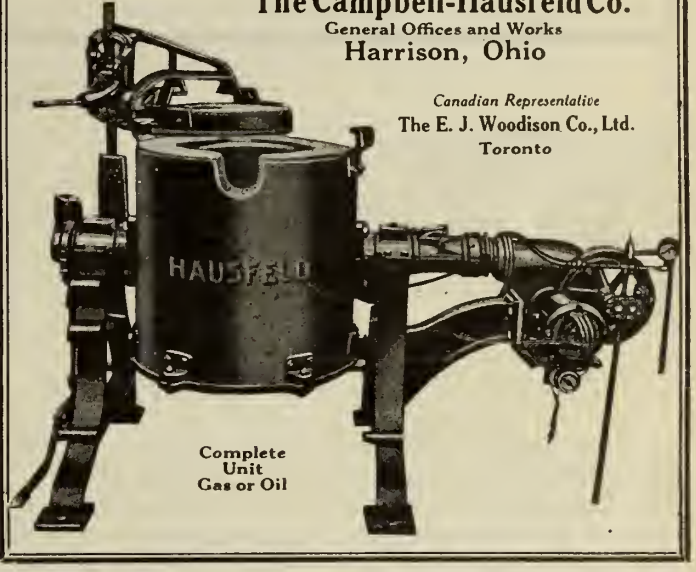

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After all is said and done the chief element of success in the sale of specialized products is their ability to produce results—economically—and satisfactorily.

All of these specialties have been tried in the crucible of experience and found to measure up to the highest standards.

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Stevens' King Kore Kompound, a black dry powder, but containing two adhesives, one to bind the green cores, so that when cores are not backed promptly the strength of the green core permits handling without injury; another that develops its strength under heat of core ovens. The ideal combination. It is used successfully when making large heavy Grey Iron cores — sometimes called "chunky" or "blocky"—also for engine beds, machine tools, railway equipment, and cores for steel castings of all descriptions. One Detroit Foundry—a large one—reported a saving of sixteen dollars per day after ceasing old methods and when using King Kore Kompound with Glutrin—not a necessary but a good combination.

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Stevens' Core Oils wherever used are a synonym for Core qualities; strength, sharp edges, durability, quick baking and quick removal from casting.

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The superiority of this emery lies in its practical results. It acts as an abrasive, it exercises its cutting qualities, then crushes and polishes. Two services are thus rendered with but one material. Stevens' Gargara Emery gives the results desired. All numbers. In kegs of 350 lbs.

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Imparts that beautiful blue-white finish — the looking glass lustre.

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. XII. PUBLICATION OFFICE, TORONTO, FEBRUARY, 1921 No 2.

Showing installation of Skinner Bros. (Baetz Patent) Heaters in foundry of Best Foundry Co., Bedford, Ohio. Note extensive area served.

The Ideal Foundry Heater

Heats your foundry from end to end, regardless of building construction, location or weather conditions. Particularly adapted to foundries since the lower stratum of air is kept equally as warm as the upper—sand never freezes and is ready for early morning use. Permits prompt and ample ventilation during time of pouring—keeps the air clear and quickly heats the building after monitor windows are again closed. Does not raise floor dust.

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Mechanical Features

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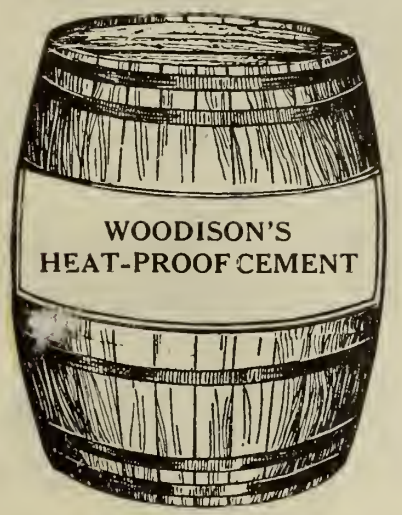

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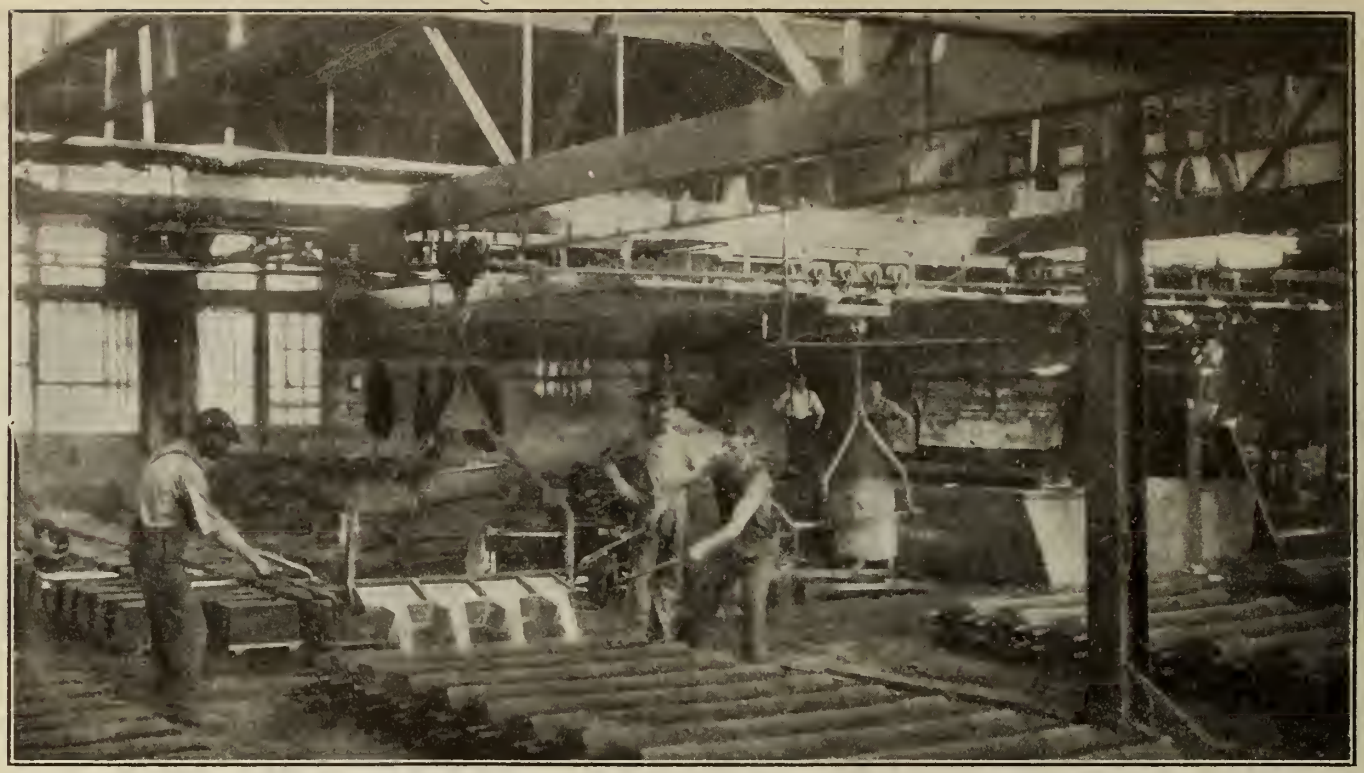
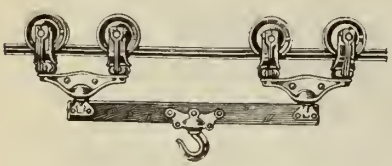


Anthes Foundry Equipped for Efficiency



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Louden overhead system solves one of the greatest problems facing manufacturers to-day. It reduces production costs. The need for improvement in this respect is shown in a large number of factories in Canada.

Large manufacturing firms are now discarding their creaking floor trucks, noisy carts, and wheel-barrows, and establishing their **interplant transportation** on an economy basis with Louden Overhead Equipment.

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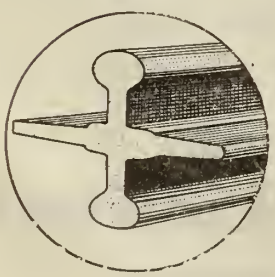

Louden Patented Overhead double beaded Steel Track is doubly reinforced and strongest built. No holes weaken it, it being spliced by clamps and hung by clamps.

save factory costs because they save man power. They make one man equal to three or more. They relieve congestion by keeping the aisles free from trucks. They save loading and unloading of trucks and cut the cost of interior transportation at least 25 per cent.

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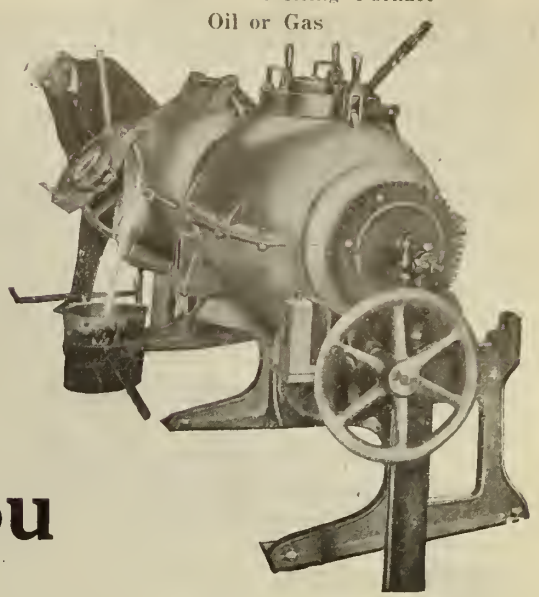
The Louden Machinery Co. of Canada, Limited

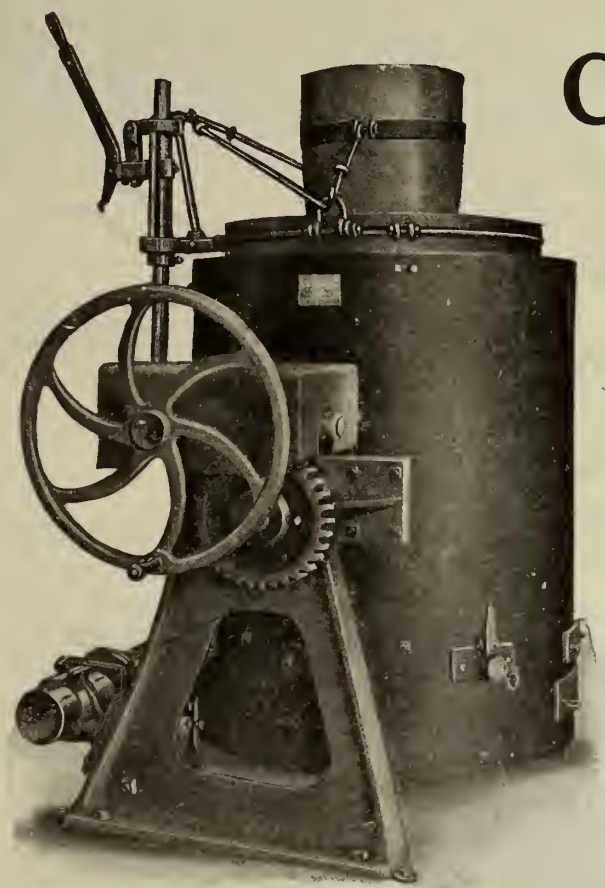
Head Office and Factory: 77 Crimea St., Guelph, Ont.

Branches at Vancouver, Winnipeg, Quebec, St. John, N.B.

Monarch Melting Furnaces Will Give You Cheaper Melts

Double-Chamber Melting Furnace
Oil or Gas





Tilting Crucible Coke Furnace

Without additional fuel, Monarch Furnaces will melt two or three times as much metal in a given period as other furnaces.

The name "Monarch," as applied to furnaces, has become a byword among foundrymen for "economical melting." Since 1903 they have been improving in variety, service and stability.

A furnace which will save fuel and time and exact nothing for upkeep and nothing for ordinary care in operating, merits your attention before waste takes another week's toll from your profits!

Write to-day; each of our several types of furnaces for coal, coke, oil and gas are described in our catalog.

The Monarch Engineering & Mfg. Co.

1206 American Building, Baltimore, Md., U.S.A.

SHOPS AT CURTIS BAY, MD.

Specialization Pays in Foundry Barrows

Having a special foundry barrow for each job pays — pays in terms of work done more quickly and with less fatigue on the workers' part.

This fact is self evident. Try wheeling a load of pig iron, let us say, and then coke in the same barrow.

Then try the same thing in the Sterling special barrow—No. 25 the special coke barrow, designed to give capacity without weight, and the pig iron in No. 17, a heavy barrow which throws the weight up front over the wheel.

Sterling specializes on foundry barrows. It will pay you to specialize, too.

Write us for catalog and full particulars.

No. 28—Sterling Special Casting Barrow

No. 85 – Sterling Special Core Barrow

No. 17—Sterling Special Pig Iron Barrow

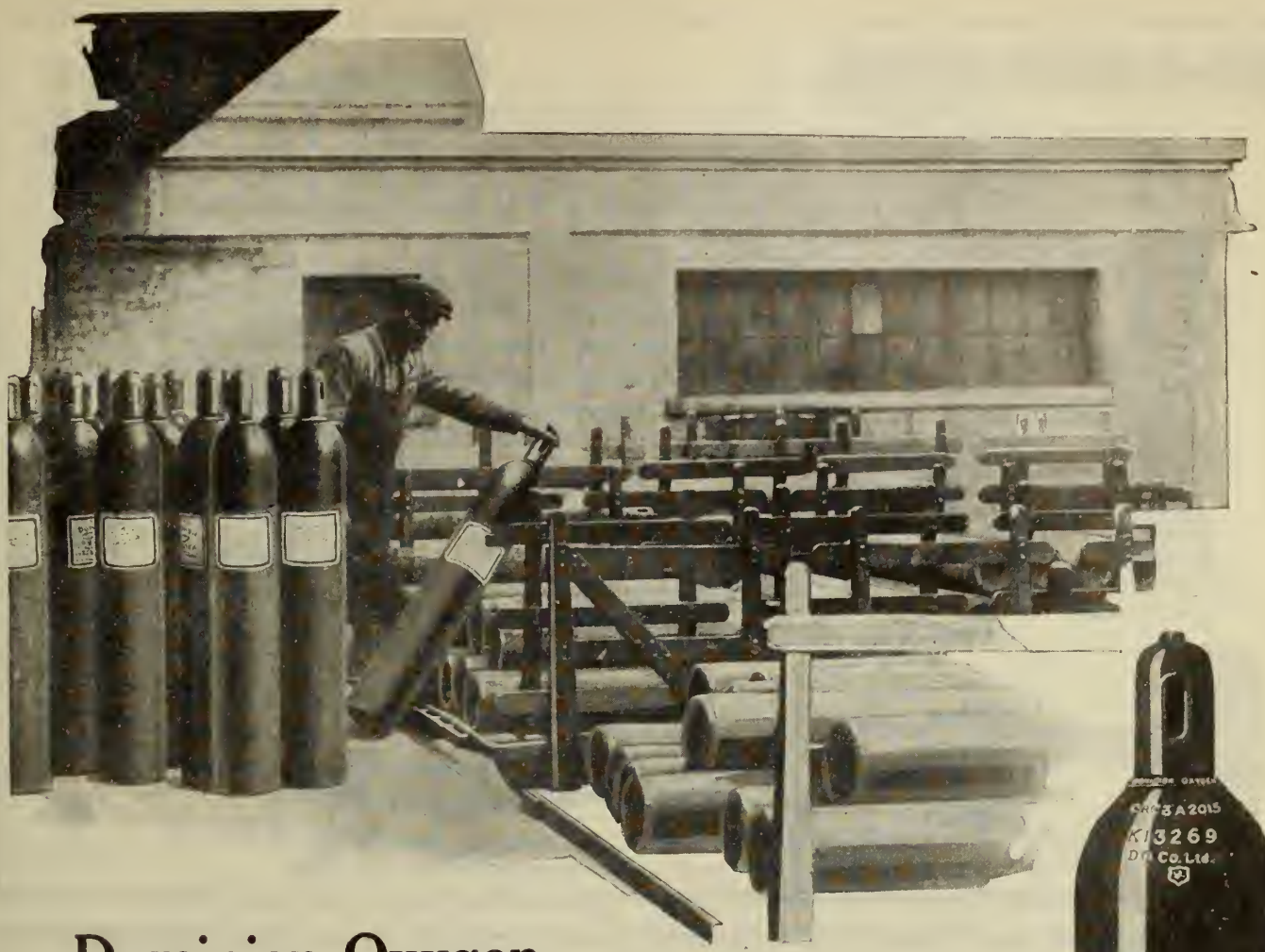
STERLING WHEELBARROW COMPANY
Milwaukee, Wisconsin

New York Boston Cleveland Detroit Chicago St. Louis

Canadian Agents: Mussens, Limited—Montreal, Toronto, Winnipeg, Vancouver

Sterling on a Wheelbarrow Means More Than Sterling on Silver

Sterling Special Barrow No. 25—for Coke



Dominion Oxygen is ready for you any time, at any place, in any quantity

THE Dominion Oxygen Company, Limited, has fulfilled its promise to Canadian Industry.

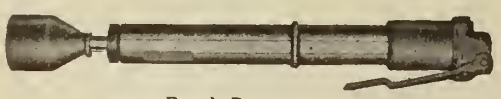
Already four of the modern distributing centers called for in its building and distribution program are in operation, and Canadian-made oxygen of the highest and most uniform purity is available in sufficient quantity to supply the entire Dominion.

Co-ordination of production and distribution has made it possible to ship orders on the day of their receipt—insuring prompt delivery to all parts of industrial Canada.

An exceptionally light and strong type of cylinder has been adopted which greatly reduces freightage and handling charges, while insuring a gas content sufficient to make constant reorders unnecessary.

Unfailing and uniform purity, always reliable immediate service, a conveniently handled cylinder of large gas capacity and a liberal policy of cylinder loans make Dominion Oxygen and Dominion Oxygen Service the choice of Canadian oxygen users.

DOMINION OXYGEN COMPANY LIMITED
HILLCREST PARK, TORONTO, ONTARIO.
HAMILTON MONTREAL WINDSOR D-14



Bench Rammer

Moisture Separator

Thor

Pioneering in 1921

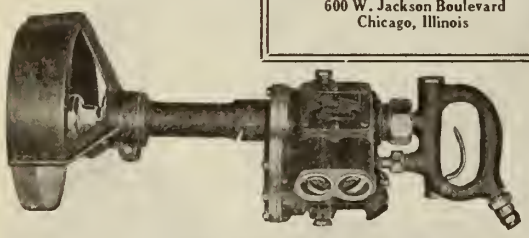
Forging ahead into unbeaten paths has not been confined to the days of '49. Into the realm of time, labor and money saving in foundry work, THOR tools have blazed their trail. Into the world's largest foundries they have gone, proving their worth, improving their construction as they went.

To-day every foundryman knows the kind of tools THORS are. Their rugged construction enables foundry superintendents to know their contracts will be turned out perfect and on time.

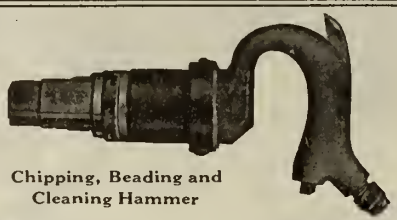
Put THORS on your foundry jobs.

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. Jackson Boulevard, Chicago, Illinois
334 St. James St., Montreal, Quebec
32 Front St. West, Toronto, Ontario
1142 Homer St., Vancouver, B.C.
123 Bannatyne Ave. E., Winnipeg, Manitoba



Portable Grinder



Chipping, Beading and Cleaning Hammer

Floor Rammer

Cleco Pressure-Seated Air Valves for Foundry Work

Style A Angle Valve

Style A, Angle Valve, allows hose to fall away from underside of Valve without bending.

THE VALVE THAT

Style F.W.

Style F.W., Four-Way Valve, is so arranged that movement of the handle controls the supply and exhaust from both ends of a double acting piston.

Cross-Section of Cleco Valve

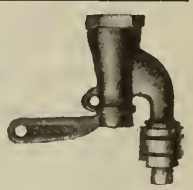
Write for Bulletin 47, describing our complete line of Valves and Fittings.

Style P.O., made in sizes ¼", ⅜", ½", ¾", 1", 1¼", 1½" 2" standard pipe outlets. Inlets one pipe size larger.

Style P.O. Parallel Valve

IMPROVES WITH USE

Style M.O. has 1-in. inlet and male Bowes coupling outlet and connects with Bowes Coupling ¼-in. to ¾-in. inclusive.



Style M.O.

BOWES PRESSURE TIGHT AIR HOSE COUPLINGS

Standard Equipment Everywhere

Instantly connected or disconnected. Absolutely air-tight under all pressures from 10 lbs. upwards.

Cut Shows Never Slip Clamps Attached

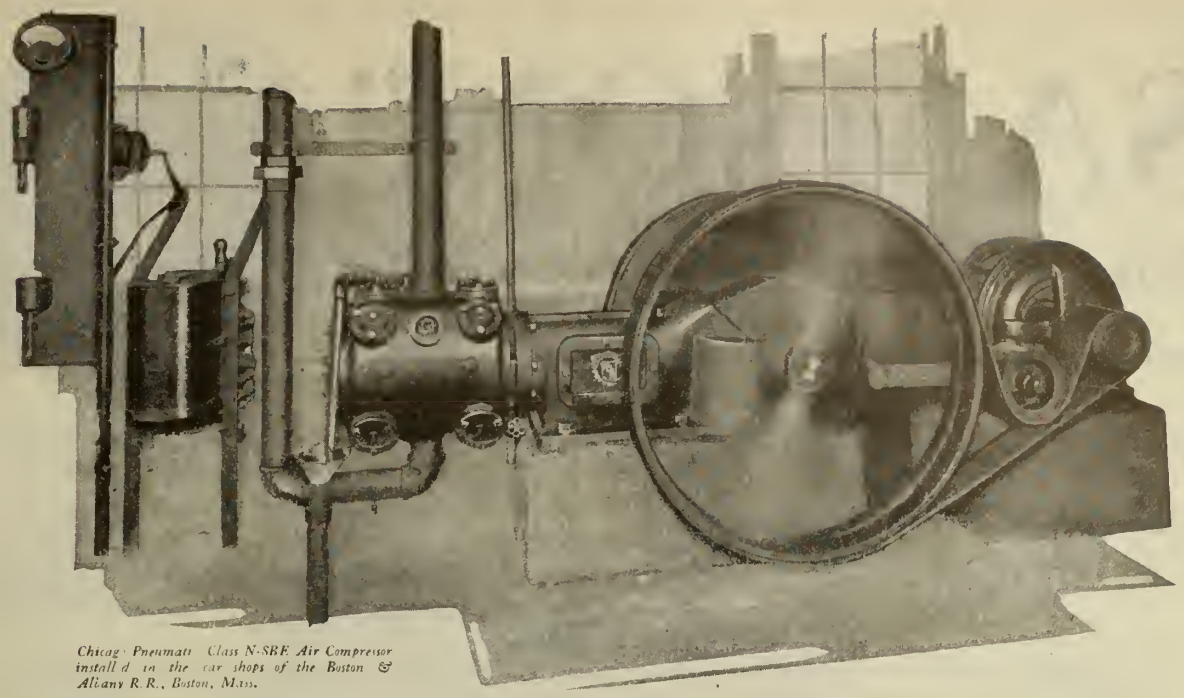
Interchangeable in all sizes from ¼-in. to ¾-in. Made of non-rusting and acid-resisting metal-brass and Nic-a-loy.

In Stock—Chipping Hammers, Sand Rammers, Portable Emery Grinders, Cleco Air Valves, Hose Fittings—everything required in foundry work.

Illustrated Catalog No. 19 mailed on request.

CLEVELAND PNEUMATIC TOOL Company of Canada, Limited

84 Chestnut St., TORONTO, ONT. 337 Craig St. W., Montreal, Que.



Chicago Pneumatic Class N-SBE Air Compressor installed in the car shops of the Boston & Albany R.R., Boston, Mass.

Where dependability counts big!

THE user of air power in moderate quantities—particularly with but one unit—needs *real* compressor dependability. In such plants an enforced shutdown means 100% air output loss.

In reality this Chicago Pneumatic Short-Belt Motor-Driven Air Compressor is a large Chicago Pneumatic "under a reducing glass."

It embodies such advanced features as: Simplate flat-disc indestructible valves, exceptionally large bearing surfaces, totally enclosed frame construction, automatic lubrication throughout, automatic regulation, insuring ideal operating economy under variable load demands.

This compact type unit is available in capacities from 69 to 1197 cubic feet per minute, for any form of drive.

Prompt delivery. Ask for Bulletin 418.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

C 66 H

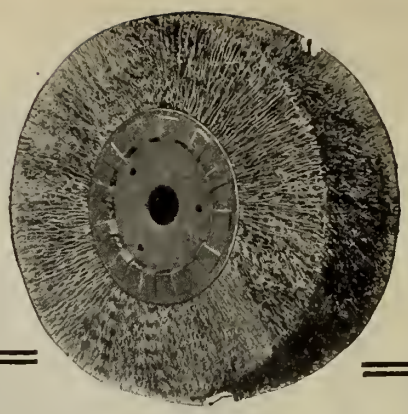
BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES · · ROCK DRILLS · · COAL DRILLS

CHICAGO PNEUMATIC

The Compressor with the Simplate Valve

"SAMSON"

Wire Wheel Brush Sections



No Hub or Holder Required

For removing scales from hot forgings, axes, shovels and other tools; for cleaning brass castings, sheet brass and copper.

"Samson" Wire Wheel Brush Sections are made to be mounted with ease and quickness. The metal disc centre is punched to fit any size of spindle. Each section is a brush in itself, making a convenient and practical method of building a wheel any desired width of face.

A trial order will convince you that "Samson" scratch wheels are the most efficient and economical brushes you can secure. Write for catalog and full information.

The Manufacturers Brush Co., Cleveland, Ohio

111 Reade Street, New York

GLOBE

Shot Blasting

Instead of Sand Blasting

Ensures 100%

Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.

MANSFIELD, OHIO

DIAMOND

MASTER FLASK

Diamond Master Flasks are light in weight, easy to handle, accurate and very durable. Their convenience and accuracy result in a larger and better production. Let your next order stipulate Diamond Master Flasks.

Sold in Canada by

Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

DIAMOND CLAMP & FLASK CO.

40 N. 14th St. RICHMOND, INDIANA

SIMPSON INTENSIVE FOUNDRY MIXER

Economical and Efficient for all kinds of Sand Mixtures

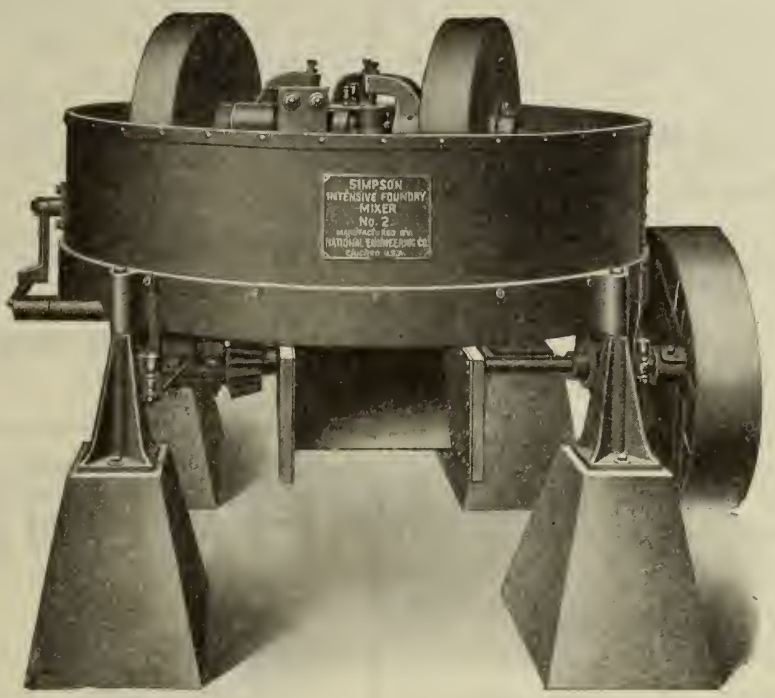
Note the AUTOMATIC DISCHARGE

It saves LABOR BINDER and NEW SAND

It improves the quality of the castings

Its work is done thoroughly not partially

Elasticity and toughness of sand are enormously increased



"The Product of a Practical Foundryman"

Thoroughly amalgamates the mixture

Small H.P. required with a minimum of repairs

Pays for itself in an incredibly short time

Original porosity of sand mixture maintained

Large capacity with a minimum of labor

Will reclaim old and worn out sand and reuse

The large number of Simpson Mixers in use all over Canada and the United States testify to its efficiency. Send for our pamphlet No. 50 and list of many users.

The Six Points of Perfection

1. Correct size and speed of mullers.
2. Effective arrangement of plows.
3. Automatic discharge.
4. Large capacity per area of floor space occupied.
5. Minimum power and maintenance cost.
6. Considerably less new sand and binder required.

NATIONAL ENGINEERING COMPANY

Machinery Hall Bldg., 549 W. Washington St.
CHICAGO, Ill.

Built to Heat Your Plant

Every Robert Gordon, Inc., heating installation is **built to fit** the individual plant. Gordon engineers, afer close study and analysis of prevailing conditions, submit recommendations for a heating unit to cope with those conditions. Unless a particular unit can be installed and operated most economically, however, it will not be recommended.

The success of a Robert Gordon, Inc., heating unit is a foregone conclusion. Not one has been a failure.

"Gordon—A Guarantee of Dependable Service"

The Mechanical Hot Blast Heater, illustrated here, is a typical Robert Gordon, Inc., heating unit. It directs the heat **horizontally** along the floor level—**all** the heat is useful. The desired temperature is maintained uniformly in every part of the building—tests have shown a minimum variation of only 5 degrees, and fuel savings as high as 50 per cent. have been noted in many instances.

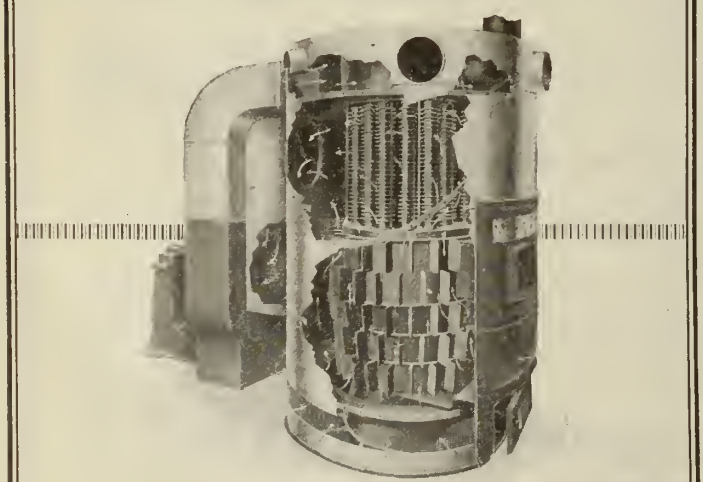
Write for free booklet, "Warm Facts in Cold Type."

ROBERT GORDON, INC.

628 W. Monroe St., Chicago

Branch Offices: Grand Central Palace, New York. Bessemer Bldg., Pittsburgh. Sun Bldg., Detroit.

Canadian Agents: E. J. Woodison Co., Limited Toronto and Montreal



The Mechanical Hot Blast Heater
"More Heat—Less Coal"

Experience Necessary

Foundry Clients

THEW SHOVEL CO
LORAIN, O.

ERIE FOUNDRY CO.
ERIE, PA.

BAYVIEW FDY.
SANDUSKY, O.

ATLANTIC FDY. CO.
CLEVELAND, O.

AM. SEEDING MCH. CO.
SPRINGFIELD, O.

It is becoming more evident every day that the economical foundry layout requires an intimate knowledge of foundry practices together with a wide experience in foundry construction. This is beyond the sphere of any one man and can only be obtained by an organization which has been built up to meet these requirements. We have such an organization and will be glad to help you with your foundry problems.

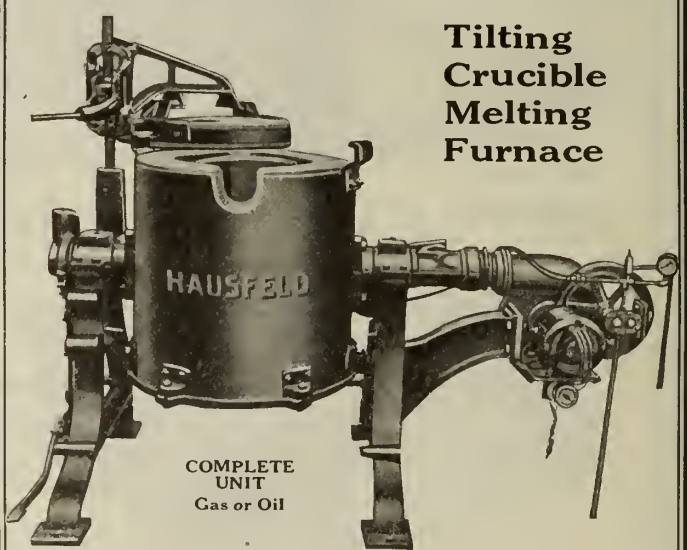
"BUSINESS IS THE HAND THAT FEEDS US ALL LET US STRENGTHEN IT, NOT WEAKEN IT"

The Osborn Engineering Co.

2848 PROSPECT AVE., CLEVELAND, O.

HAUSFELD

Tilting Crucible Melting Furnace



COMPLETE UNIT
Gas or Oil

No equipment other than piping to the gas meter and the fuel oil reservoir is necessary. The furnace can be had without the fuel oil feeder and burner if desired, but for emergency purposes, in event of failure of gas supply, the complete unit is of great advantage. Hausfeld Furnaces cut melting costs. Send for complete description.

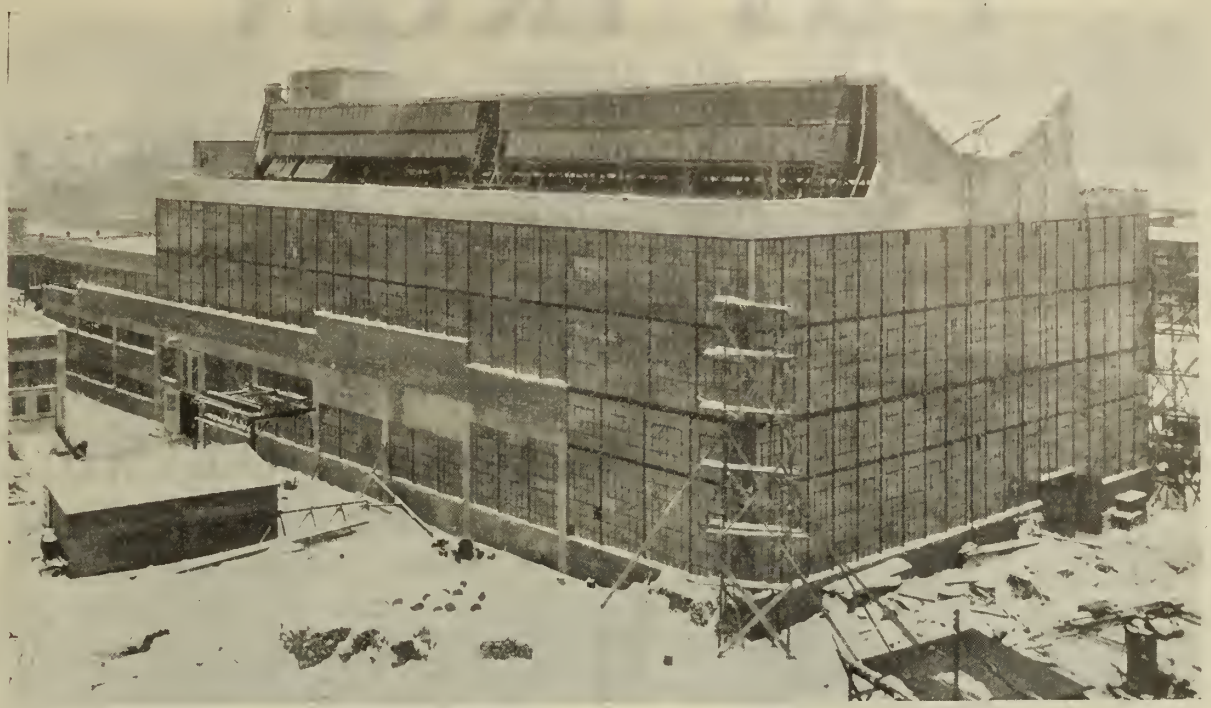
Manufactured only by

THE CAMPBELL-HAUSFELD CO.

General Offices and Works: HARRISON, OHIO

Canadian Representative

THE E. J. WOODISON CO., LIMITED, TORONTO



NEW FOUNDRY GRINNELL CO. OF CANADA, LTD.
DESIGNED BY THE H. M. LANE CO.

A Foundry Designed by a Specialist

The engineering profession has many ramifications, each of which constitutes an important branch in itself.

Can ability in this field reach its acme of efficiency by displaying its talent along general lines? Considerable experience in the foundry end leads us to emphatically answer No.

Our business is foundry engineering, in which we have specialized for a good many years. Like the general medical practitioner, he who would cater to all industrial ills cannot hope to attain the same degree of efficiency possible by the specialist, through concentration of time and effort.

We will be very glad, indeed, to have one of our engineers give you in person a resume of our past work and to outline our method of helping you in planning a modern foundry or improving an existing one.

THE H. M. LANE COMPANY

Industrial Engineers and Foundry Specialists

Owen Bldg., DETROIT, Mich.

Canadian Office : **The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.**

PIG IRON

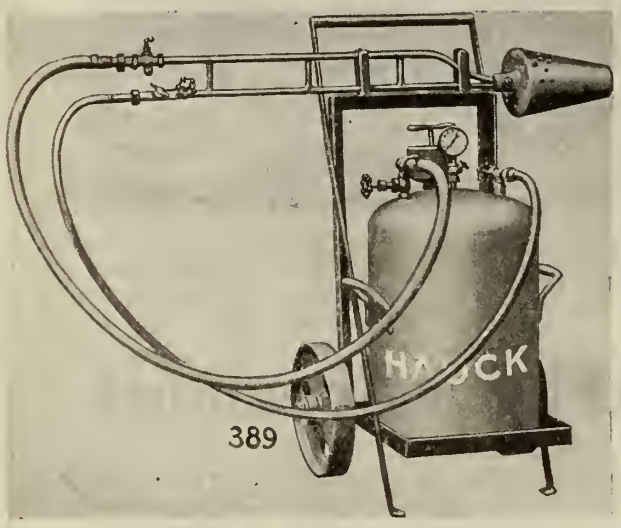
(ALL GRADES)

FERRO MANGANESE—FERRO SILICON

Stock and Import

A. C. LESLIE & CO., Limited, MONTREAL

The HAUCK



COMPRESSED AIR TYPE BURNER

Lights Instantly--Without Pre-heating

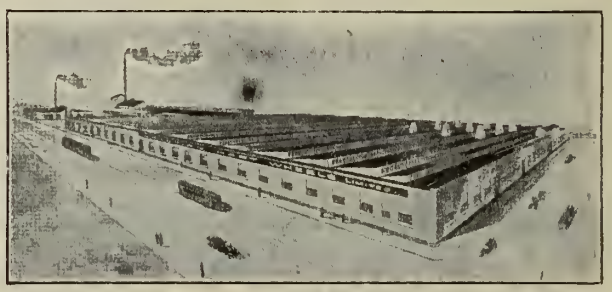
Every desirable feature is found in the Hauck—it is the perfect burner, built for every-day hard service. Burns the cheapest grade of crude fuel, kerosene oil or distillate, with compressed air under any pressure varying from 20 to 100 pounds! Light in weight! Strong! Easy to handle! Send for illustrated booklet describing complete line of Hauck Burners, of special interest to Foundrymen.

Canadian Hauck Burner Co., Ltd.
PORT HOPE, ONTARIO

CANADIAN HART WHEELS

CUT FASTER LAST LONGER

Than any other wheels on the market



Our New Modern Plant.

EMERY WHEELS A SPECIALTY
WE SOLICIT EXPORT TRADE

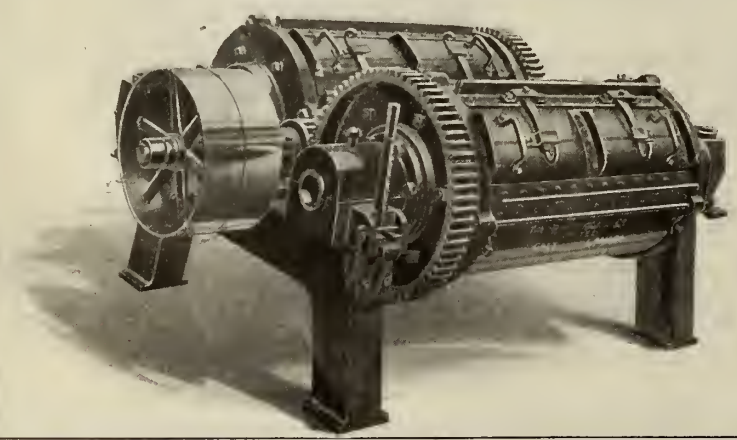
Tell us the service you want performed and we will supply you with an abrasive wheel that will save you time, money and worry.

Send for one of our catalogues and tell us your troubles. We do the rest.

CANADIAN HART PRODUCTS, Limited

Successors to

Canadian Hart Wheels, Limited
HAMILTON - - - ONTARIO, CAN.



EXHAUST TUMBLING MILLS BUILT IN DOUBLE FILE

Constructed in the same efficient manner as all other McDougall products.

Each Mill may be run separately, which proves a decided advantage when filling or emptying.

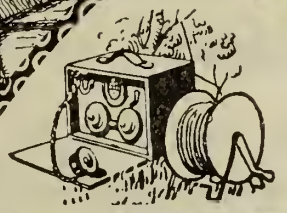
Properly protected Ring Oiling Bearing.

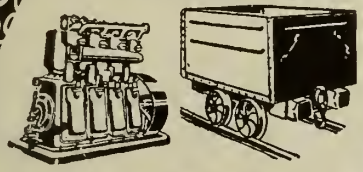
Guaranteed for Long, Continuous, Satisfactory Service.

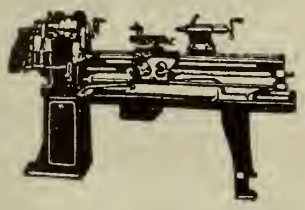
THE R. McDOUGALL CO., LTD.
GALT, ONTARIO

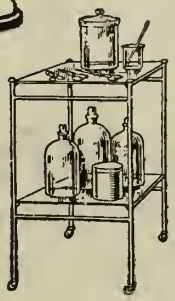
G R

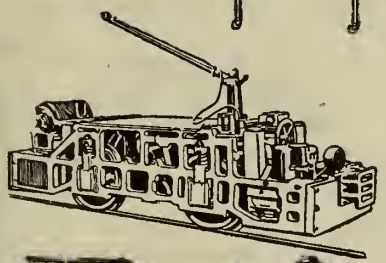
MINISTRY OF MUNITIONS

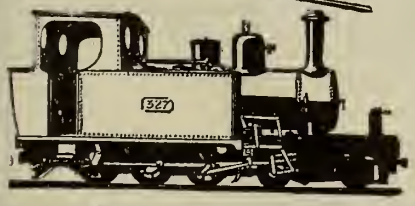












The Disposal Board Have

STOCKS

Lying in the United Kingdom and

AVAILABLE FOR EXPORT of

ENGINEERING STORES

- Plant and Machinery
- Steam Engines and Boilers
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- Road Bridges
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Buyers should instruct their representatives in the United Kingdom to communicate with the Secretary Disposal Board, Ministry of Munitions, Caxton House, Tothill St., London, S.W.

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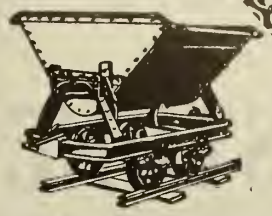
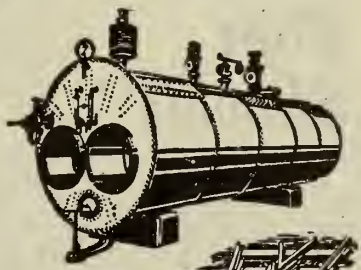
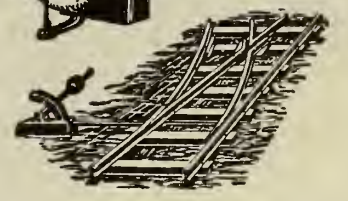
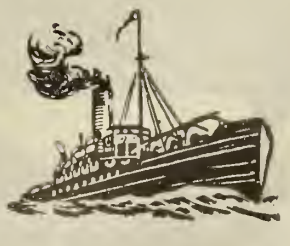








Investigate Your Foundry Costs

BLYSTONE SAND MIXER

"The Mixer That Shovels"

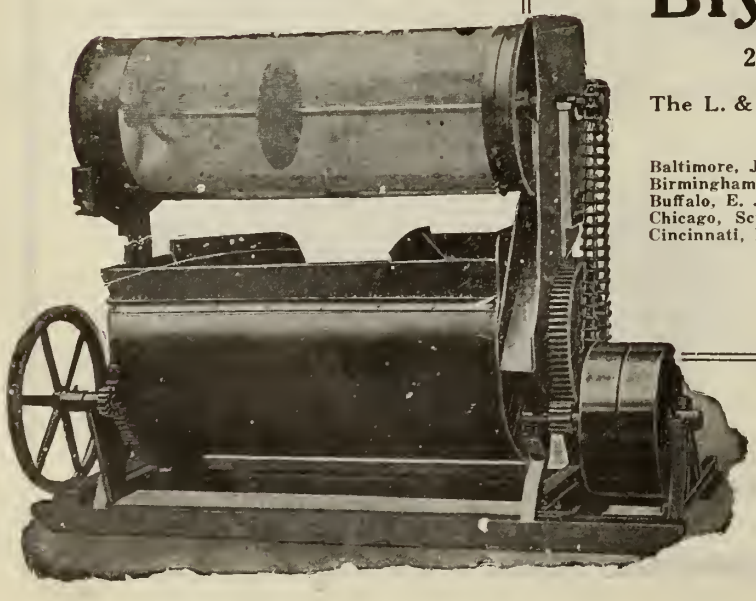
What Are Your Sand Mixing Expenses?

If you're mixing by hand it is just about 60% more than it ought to be, or need be.

In over 1,000 leading foundries throughout Canada and the United States the Blystone is daily demonstrating its ability to cut mixing cost at least 60%, produce a better mix and save from 10% to 20% in binder.

The Blystone is the only mixer with adjustable shovels. It *shovels* the sand over and over, and, with every revolution of the shaft, throws it from end to end of the drum.

Watch a Blystone at work on your sand. We have one already to ship you on 10 days' free trial. Write us to-day!



Blystone Mfg. Co.

221 Ironton St., Cambridge Springs, Pa.

The L. & P. Manufacturing Company, Niagara Falls, Ontario
Manufacturers and Distributors for Canada

Baltimore, J. W. Paxson Co.
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Your Foundry is Not Up-to-date if You Have Not an

Electric Sand Riddle

Installed, Whether of Our Make or Any Other

Your Competitor With One in His Plant Will Have the Edge on You

NATURALLY we think ours is the best Riddle made, both as regards capacity and the ease with which it can be run from one part to another of the foundry.

TO BACK THIS UP WE ARE PREPARED TO PLACE A RIDDLE IN YOUR PLANT ON TRIAL, ALL CHARGES PREPAID, AGAINST ANY OTHER RIDDLE MADE, AND LEAVE IT ENTIRELY TO YOU TO DECIDE AT THE END OF THE TRIAL PERIOD WHICH RIDDLE IS THE BEST PROPOSITION FOR YOU.

It won't cost you anything to sign your name on the form below and have one come along for a thorough trial on the above understanding.

We Take all Chances—You Take None

Ready for Immediate Shipment, for Either 25 or 60 Cycle

The Preston Woodworking Machinery Co.
LIMITED

Preston, Ontario, Canada

The Preston Woodworking Machinery Co., Limited
Preston, Ontario

Gentlemen: Please ship us (or me) on 15 days' trial by ..... freight prepaid one "Preston" Ball Bearing Electric Sand Riddle for ..... cycle ..... volt current. At the end of the above trial period I am (or we are) privileged to return the riddle if not satisfied in every way.

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OSBORN

Osborn Jolt Stripping Plate Squeezer

Osborn Jolt Stripping Machines

Made Regularly in the Following Sizes:

No. 84L	Maximum Over-all	22″ x 80″
No. 404S	Flask Capacity	27″ x 50″
No. 405S	" "	29″ x 57″
No. 405LS	" "	29″ x 60″
No. 406S	" "	42″ x 75″
No. 448	" "	18″ x 18″
No. 449	" "	21″ x 22″
No. 449L	" "	20″ x 29″
No. 450	" "	19″ x 36″
No. 450W	" "	26″ x 36″
No. 450M	" "	26″ x 42″
No. 451S	" "	28″ x 40″

This new type of Osborn Jolt Stripping - Plate Squeezer was shown for the first time at the American Foundrymen's Association Convention held at Columbus.

This machine is designed for making soil pipe and other long, narrow work of similar character. The machine as shown above is furnished with wheels and power drive which moves the machine on a T-Rail track so that it follows the sand pile. If desired it can be furnished without wheels or power drive so that it will operate in a fixed position.

The Capacities of this Machine are as Follows:

Distance between strain rods ..... 85¾ inches
Pattern Draw .....4 inches
Jolting capacity 1200 lbs. per half mould
Table Size .....22 x 80 inches

If you are experiencing any difficulties with your present work or contemplating any new work, consult our engineers. They are experienced in foundry practice and equipment and will be pleased to help you solve any old or new problems. They are familiar with all kinds of machines and equipment and will be pleased to give you the benefit of their experience. This Osborn service puts you under no obligation.

Ask for your copy of the 1920 Condensed Catalog.

Some Osborn Moulding Machine Advantages:

1. Insure rapid production
2. Lower direct moulding cost
3. Accelerate Delivery
4. Effect saving in material
5. Lower overhead per ton
6. Reduce grinding
7. Lessen Pattern Repairs
8. Relieve labor shortage

THE OSBORN MANUFACTURING COMPANY

INCORPORATED

Main Office and Factory

New York — 5401 Hamilton Ave. Cleveland, Ohio — San Francisco

FOREIGN REPRESENTATIVES

Allied Machinery Co. de France, 19 Rue de Rocroy, Paris, France.

J. W. Jackman & Co., Ltd., Caxton House, S.W. 1, London, Eng.

Horne Company, Ltd. 6 Takiyama-Cho, Kyobashi-Ku Tokyo, Japan.

E. Isbecque & Cie 36 Rue Otlet Brussels, Belgium.

Allied Machinery Co. d'Italia 40 Corso Dante. Torino, Italy

Overhead Trolley System in Soil Pipe Foundry

Method of Using This Type of Conveyor to Advantage, Together With a Cycle of Operations of Moulding and Casting the Pipes.

THE moulding and casting of soil pipe is a comparatively simple process, even when done in the crudest possible manner, as there is no great amount of complicated features in connection with a plain round pipe, with one end slightly enlarged to admit the small end of the next one. This, however, is just an optimistic view of old-fashioned methods. Simple as the design of the pattern may be, the process of production can be greatly simplified if modern methods are adopted.

Primarily it was our intention in this particular instance to pay special attention to the handling and conveying of material in a soil pipe foundry, where the amount of overhead trolley track would exceed a mile. It is almost inconceivable at first thought that this amount of track could be utilized in a Canadian foundry, but such is the case.

In using the trolley system no elaborate outlay is necessary.

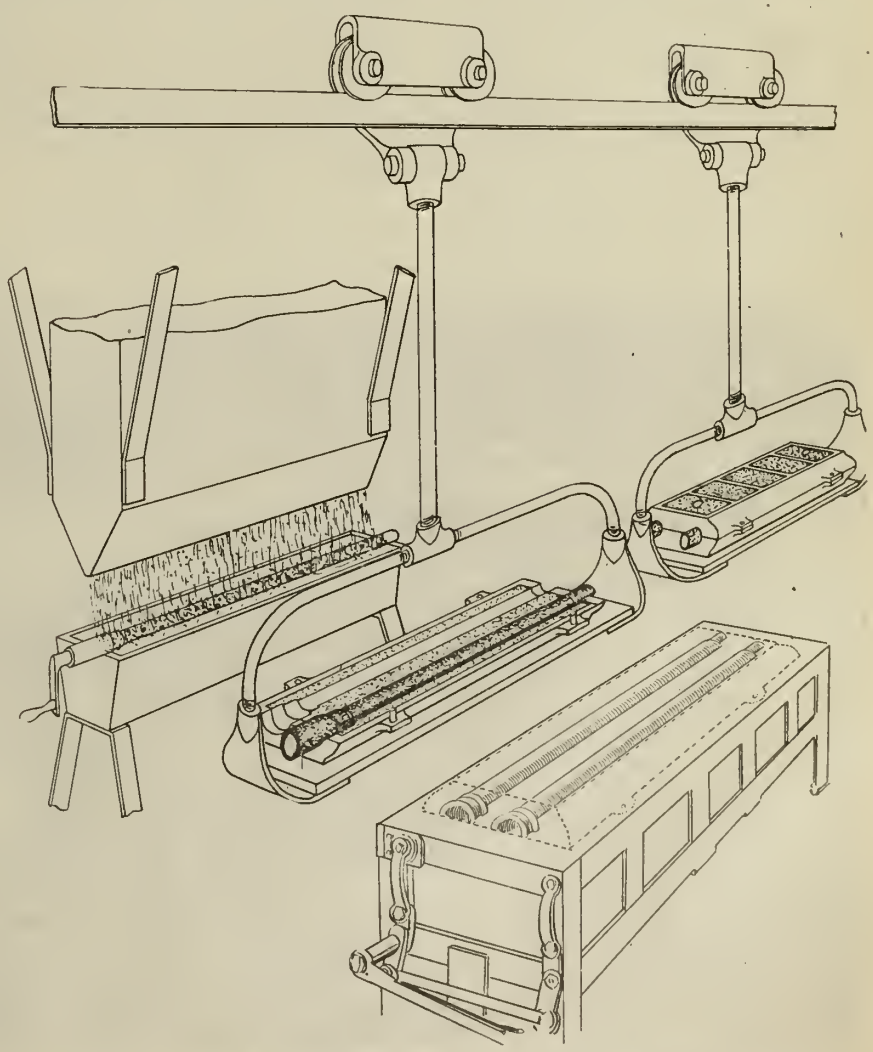
Even though no improvements are adopted in the method of moulding, the trolley still has its place in conveying the metal to the moulds or conveying the moulds to the metal, in taking the castings to the tumbling mills and from there to the japanning vats, and so on through the entire plant until the pipe is placed in storage.

For the benefit of those who have never visited a modern soil pipe foundry it will undoubtedly be of interest to follow the cycle of operations from beginning to end. Photographs of the different departments would have such a similarity of appearance that we will not go extensively into that line of instruction, but will show a few drawings of the different machines used and one general view in the shop taken by the camera. Unlike the ordinary foundry, where a variety of work is done and where an enormous amount of equipment is required, the soil pipe foundry requires but few units of equipment, but this should be of the best. Some will prefer to have sand heaps on the floor, while others will have all the sand overhead. The most satisfactory method is to have a basement under a small portion of the foundry and an overhead staging wherever moulding is done. At least two cupolas should be installed, so that continuous pouring can be practiced, one being prepared while the other is being used. Where the moulding is being done there should be a straight passageway, with the moulders on one side and the coremakers on the other and the trolley line midway between them. The moulds are made on stripping plate machines, while the cores are made on revolving arbors. The trolley platform hangs about a foot from the floor. Each machine is fitted with two patterns exactly alike and spaced exact on the machine. The flasks are also fitted with the same degree of exactitude. By this means the same machine makes cope and nowel. The gates are between the two patterns and are fastened to the stripping plate. They only require to meet one of the patterns, for the reason that the pattern which makes the nowel of one pipe makes the cope for the other, thus the gate which met the nowel of one meets the cope of the other, or in other words, one pipe is gated below the parting and the other above. Two pouring gates are required and the moulds poured with two ladles. The platform on which the moulds are placed when lifted from the machine to the trolley is slightly longer than the flask, so as to admit of setting the core without the hangers interfering. This table should be perfectly true.

The flask, as will be seen, is shaped to the patterns on the outside and has bars, which will, of course, be in the nowel as well as in the cope, since the same flask does for both.

The sand is mixed and sifted in the basement and conveyed by sand conveyor to the overhead bin, from which it is delivered through chutes to the moulders. It would be quite possible to have it fall from the chute into the mould, but this has not been considered good practice on work of this kind, as the moulder requires a shovel anyway, and while he has it in his hand he uses the handle for the rammer peene and the back of the shovel for the hot. The sand drops from the chute in a pile beside the machine and the moulder shovels it into the flask. Very little sand is required to fill a flask of this kind when the space occupied by the patterns is deducted.

As the sand has all been sifted in advance there is no occasion to sift it again for work of this class. The moulder simply shovels it in and then reverses



SHOWING CYCLE OF OPERATIONS IN SOIL-PIPE FOUNDRY. CORE PRINTS AND GATES WHICH SHOULD BE SHOWN ON PATTERNS ARE UNFORTUNATELY OMITTED.

the shovel, and with the handle for a rammer goes all around between the flask and the patterns, the shape of the flask making it necessary for him to ram away from the pattern in order to ram under the side of the flask. By this means he can ram as hard as he likes, making a good solid joint on the mould without making the sand too hard against the pattern. He also rams between the patterns, which, like the other, is only ramming against the machine table and does not affect the sand which is in contact with the patterns. The back of the shovel is used to pack the sand over the part which has not been rammed. The sand is now struck off true to the flask with a straight strike, and this part of the mould is done. The lever is now thrown sufficient to drop the pattern about a half an inch to relieve it from the sand and the flask is lifted away and placed on the platform of the trolley. While this is being done the man on the opposite side is making the core.

Making the Cores

The machine on which the cores are made might almost be termed a lathe. It consists of a table with open top and heads at the ends, with half round bearings, into which the arbor is placed. In front is a flat plate with the edge shaped to the exact outline of the core. This is the tool which cuts the core to the proper shape. The arbor is a cast iron pipe the shape of the core, but about an inch smaller in diameter and perforated all over with holes about a quarter of an inch in diameter or slightly larger. The sand for the cores is not allowed to fall on the floor as was the case with the mould. Instead of this the sand is held in a hopper, which is the same length as the core, and hangs directly over the core and almost down to it. In this hopper is a sieve, which operates by electric motor. The arbor is dipped into thin clay wash and allowed to drain, after which it is placed in the machine and a crank put on the end. The power is now turned on and the sand sifter begins to operate and sifts sand down through the chute on to the arbor, which is being removed by hand. The first sand which strikes the arbor will not be sufficient to reach to the strike-off tool or straight edge, but as the arbor continues to revolve and the sand continues to be sifted on the core gains in size until the straight edge is reached. If too much sand got on at once the straight edge, in scraping it off, would be apt to tear it off in chunks and destroy the core, but by doing as described very little is scraped off at a time and as soon as the core is the full size the entire length the power is turned off and after one more revolution the core is done. The crank is now removed and the core placed in the mould.

It is quite convenient for one coremaker to keep up to two moulders, so by the time the nowel is made the first core is ready to be set, and by the time the second core is put in place the cope is ready to be put on. The moulders lift their work to the platform and the man who clamps up helps the coremaker to set the cores. When the mould is finished it is shoved out of the way and another one begun.

Pouring

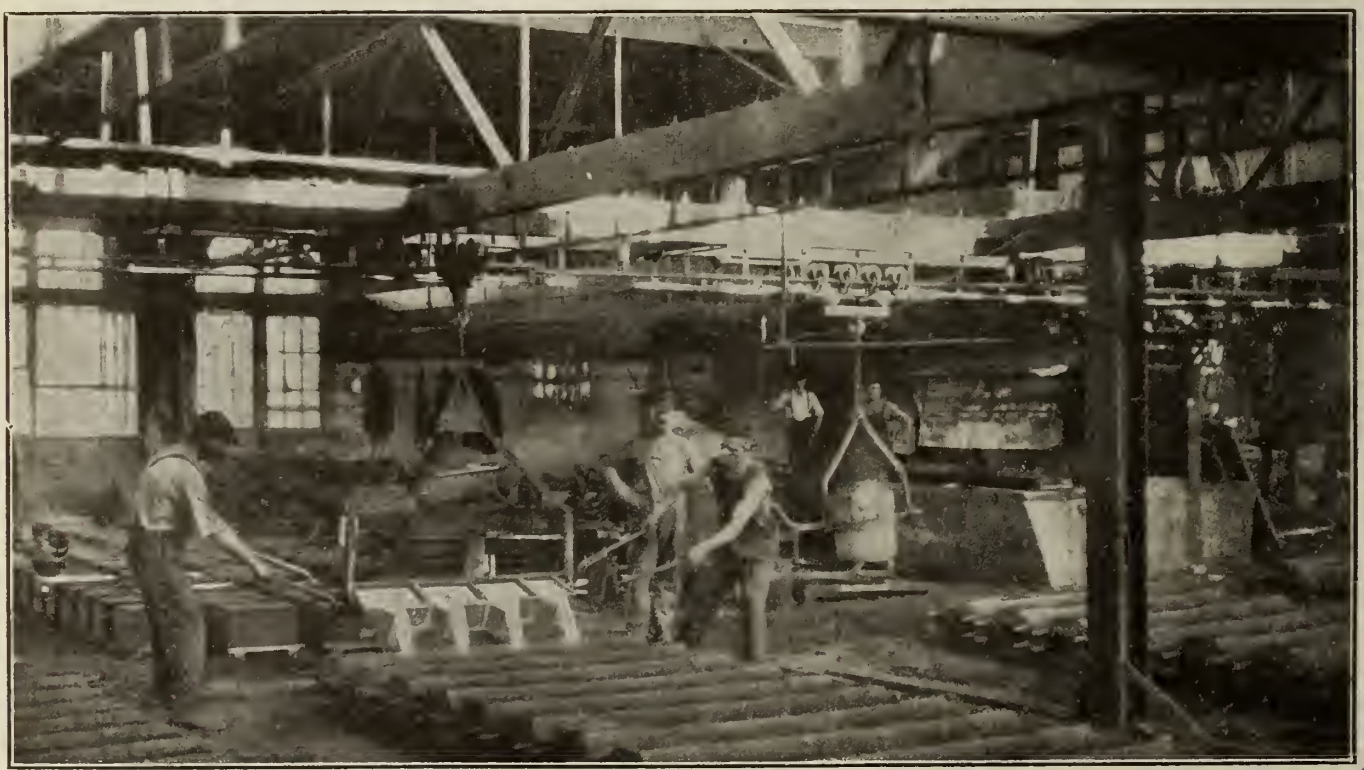
The pouring is all done in front of the cupola or in that vicinity. Originally the pouring was done by four men with hand ladles. These men stood right at the cupola and poured the moulds as they passed, but since the advent of the pouring device which is attached to the trolley track it is not essential that the pouring be done at any particular spot. It is, however, advisable to keep close to the spout, as a separate track must be provided for the ladle and this track need not be any longer than what is required to carry two ladles for pouring, while two others are filling.

The cupola is lit up early enough in the morning to permit of putting on the blast when the men begin to put up the moulds. By the time the moulders have a few moulds ready the metal is ready with which to pour them.

As soon as poured the moulds are shoved on a little further, where the arbor will be driven out and stood in a tank of water. The cope will be lifted off and shaken out over a grating in the floor, allowing the sand to fall through to the basement. The nowel will next be lifted off and the casting dumped out over grating and the nowel shaken out. The flasks and the core arbor are again placed on the platform and shoved around to their place on the moulding and coremaking floor.

Few Flasks and Arbors Required

From this it will be seen that very few flasks and arbors will be required for each gang of men, whereas with the old method of doing a day's work before pouring off, each man required an enormous number of flasks and arbors. It will also be seen that while two cupolas are required they will be small ones, while one very large one will be required



VIEW IN ANTHES FOUNDRY, WINNIPEG, WHERE ONE MILE OF OVERHEAD TRACK HAS BEEN INSTALLED. NOTE 4 GATES BEING POURED SIMULTANEOUSLY WITH A LOUDEN DEVICE.

with the other method. In addition to this a small foundry takes the place of a large one, which in itself offsets the cost of all the installations. A few things to be remembered in fitting up for this class of work will include the oft repeated argument that no makeshift arrangements can be tolerated. The flasks should fit perfectly on the machine and, of course, if the flasks all fit the machine they must all be exactly alike. Each flask will have two pins on one side and two holes on the other. The pins do not require to be more than an inch long, but they must fit. The ends of the flasks should be bored out and the arbors should be turned to fit the flasks. The core-turning machine should have guides which will insure that every core is the exact size. From what we have seen a comparatively small shop and a small amount of equipment, with a few men, will do an enormous amount of pipe work in a day. The sand, as we have shown, falls through the grate into the basement, where it is tempered and transferred to the overhead bins to be used over and over again, demonstrating that a small amount of sand does the work. The castings will be a short time in cooling sufficiently to be handled, after which they will be transferred by trolley to the mill room.

Other Methods

Some foundrymen do not favor this method in all its details, but prefer to have the machines on wheels and have parallel rails running the entire length of the floor and by placing the machine on the front of the floor the moulds are placed on the rails, which are perfectly level. The core-turning machine would be in the rear and the cores carried to the front to be placed in the mould. By this method the metal is delivered by trolley to the moulds and poured in the manner already described. Otherwise the process is the same.

No matter what method is adopted the trolley system is indispensible and a fully equipped modern soil pipe foundry will require a mile of track.

Soil pipe foundries are not the only class of foundry where this type of conveying device is used. Every kind of a foundry has an abundance of uses for the overhead trolley system. In many foundries where jib cranes are used the trolley is used to convey the crane ladle of molten iron from the cupola to whichever floor it is to be used upon when it will be transferred to the crane for pouring. This is a much more convenient and rapid method than transferring from one crane to another. Where only one travelling crane is installed the trolley system is utilized to handle empty crane ladles and place them under the spout after the crane takes away the full ladle. The trolley is also used to deliver small sized crane ladles of iron, thereby allowing the heavy crane to be kept at work for which it is indispensable.

The track can be run into the flask yard and saves a lot of labor in delivering flasks to the moulders.

In fact, a well equipped foundry should have all departments connected by trolley, as no better paying investment can be made in the way of purchasing foundry equipment. The day of lugging iron in the foundry has about passed and if moulders or even laborers are to be secured for the foundry the iron must be handled mechanically, and for general purpose foundry work, such as formerly called for hand carrying, the trolley system stands supreme.

WHY BOYS DO NOT TAKE TO THE FOUNDRY BUSINESS

Mr. Editor:—After reading Mr. Hedley's remarks in January Foundryman, on the subject it occurred to me that more might be said and as it is an old topic with me I will submit some more views. To begin with I am not a molder, but a machinist. However, there is very little of the actual work of the foundry I have not done and this during several years.

To my mind, the worst reason in the list handed to Mr. Hedley is "no brains required." That too many in the trade are not overstock with brains is not the fault of the business and accounts in large measure for the number of bad castings. Now, good castings are what are wanted and failure to produce them indicates lack of knowledge of the means and procedure to produce them, not necessarily lack of brains, but a lack of educated brains.

In my judgment there is as much use for brains in a foundry as in any other business. Concerning the danger and dirt, there is no more danger in a foundry than in many other places and as for dirt, it is of a kind that is easily washed off, not like that of a machine shop.

Other Disagreeable Operations

From what I have been able to learn of callings, I would put the medical profession at the head of really dangerous and disagreeable occupations, yet there are plenty of boys willing to follow it. And there is much to disgust in law practice.

The Other Side of the Question

Another of the reasons handed in was "No promotion." This hits close to the mark. Being made a foreman is not much in that line as the compensation a foreman receives is out of all proportion to what he has to endure and the same may be said of a superintendent. The average healthy boy wants to think of something besides the shop during the evenings. Occasionally one does study in the hope of advancement and often becomes very proficient. He then gets a big surprise. He finds that wages do not correspond to amount of production but the cost of living. If on a time basis, he will learn that turning out double the quantity will not bring double pay, and if on piece-work he will find that as his efficiency increases, the rate of payment decreases, leaving him about the same income. This is no joke or dream but an established rule. Another feature is that a person who becomes expert in some line is usually kept there because he is more profitable there.

The boys in the shop tell these things to those who are considering the selection of a trade or profession, and the result is the present condition. In the days of the guilds the master held the apprentice as a slave for a definite time, with the understanding that the master would teach the apprentice and in return have the product of his labor. Each had an interest in the other How is it now? A gang boss put it thus, "Why should I educate a competitor?" This remark explains the decrease in skill apparent among so-called mechanics, and is logical. Let a boy take up a profession and how different the result to him! And here it may be well to note the difference between a trade and a profession.

Trades and Professions Differ

Those who work at trades are expected to get along on an income that will enable them to exist and reproduce their class, and any attempt to improve their condition is a proper subject for police suppression. Those in professions decide to fix rates for services to suit themselves and no one interferes. Hence the boy who can takes up a profession.

Improvements in Equipment Justifiable

There is no excuse for continuing the back breaking methods in common use in foundries. They have vanished from machine shops, and the advertising pages of the Foundryman show that the means are obtainable for replacing them with modern and sensible adaptations in the foundry. These pay in the machine shop and will in the foundry if installed.

A partial solution might result if prospective molders were educated as physicians are and decent conditions instituted in the foundry. It may become necessary to compel people to work at trades, but how? The Russian method, conferring civil rights on only those who do productive work may do it, but that does not fit American ideals.

JAMES BELL.

RECOGNIZING GENIUS

Merchant (to detective)—"Some fellow has been representing himself as a collector of ours. He's been taking in more money than any two of the men we have, and I want him collared as quickly as possible."

Detective—"All right. I'll have him locked up inside of a week."

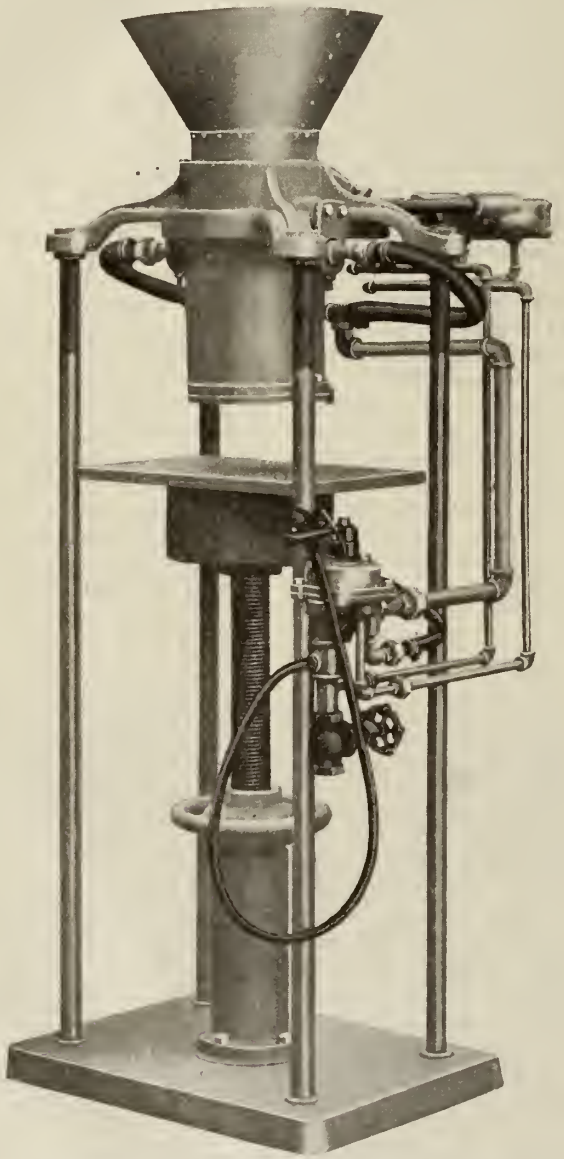
Merchant—"Good heavens, man! I don't want him put in jail. I want to hire him."

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

COMPRESSED AIR CORE MACHINE

The foundry engineers of the E. J. Woodison Co., Ltd., Toronto, have designed a new core machine operated by compressed air. The manufacturer advises that an output of 180 cores an hour is being produced by the machine.



AN OUTPUT OF 180 CORES PER HOUR IS GIVEN AS THE PRODUCTION FOR NEW WOODISON COMPRESSED AIR CORE MACHINE.

The operator places the core box on the machine, turns a handle a quarter turn, and the core is completed. The cores made, it is explained, are of a uniform density and have a natural venting because the air is forced through the core carrying the fine sand to the outside giving a smooth surface and allowing all gas to pass off freely. The machine is practical for two part or split core boxes that ordinarily have to be made in half, and either pasted together, or the box closed while green. When this is done, sand gets in the joint and results in a core that is larger than the actual core box. With this core machine, it is pointed out, this is not possible, because the box is closed and the sand is forced into the end, thus giving a core of actual size.

Several of these machines have been installed in Canadian foundries recently and favorable reports have been received regarding them.

SOMETHING NEW IN MOLDER'S BOOT

Watt's Shoe Company, Albion Street, Amherst, Nova Scotia, has brought out a new molder's boot which is reputed to have advantages heretofore unknown in the foundry. It has a neat fitting elastic side similar to any first-class gaiter which protects the ankle. In addition to this, it has an ankle protector which eliminates any possibility of hot iron or sand which might be spilled against the ankle from penetrating into the boot. It also has a special sole which protects

MOLDER'S BOOT, ANKLE PROTECTOR NOT SHOWN.

the leather against hot iron or sand. The boot is made of solid leather and has three rows of heavy stitches all over. In fact, the boot is made on purpose for the class of usage it will be subjected to in the foundry, and is being sold direct to the molders or to any employer who wishes to supply his men with boots at cost or otherwise.

SPECIAL ROTARY WIRE BRUSH

The Independent Pneumatic Tool Co. have now ready for sale a special Thor rotary wire brush for use on portable pneumatic and electric grinders. In reality, the brush attachment makes two tools in one, because the grinder can be used with emery wheel, and with very few changes the brush attachment can be added.

The brush is Thor made throughout, the wires are all of equal length, interchangeable, and are made of specially treated steel. The concave wood back which in turn is fitted inside a metal cover, secures the brushes in position, which also permits of tapered ends, or working surface, allowing the wires to bend under pressure without breaking.

The brushes are particularly useful for removing paint, rust, scale, grit, dirt, sand, etc., in one-fifth of the time required by hand. For such work as cleaning steel cars, automobile bodies, steel frames, tank cars, foundry castings, sheet metal of all kinds, these brushes cannot be excelled.

THE WODACK NEW AUTOMATIC-STOP DRILL

The Wodack Electric Tool Corporation 23-27 South Jefferson St., Chicago, U.S. A., have recently perfected a new portable electric drill in which they claim to have developed many new features. The drill is motor driven, using either alternating or direct current, and automatically stops when not in use. This is due

PORTABLE ELECTRIC DRILL.

to the fact that the current-contact functions through a spring lever in the handle which is released as soon as the pressure of the operator grip is removed, much on the same order as the valve on a pneumatic hammer on the same principle as the "dead man" grip controller used by the elevated railway system in Chicago. The motors are of the company's own design and manufacture, series laminated type, and are self-adjustable in speed to the size bits used. The switch is of a quick make and break, located at the top handle, and operated with the palm of the hand. As pressure is released, switch shuts off current automatically, thus avoiding the drills running empty and at the same time ensuring the operator of having control of the drill at all times. The gears are of chrome nickel steel and are heat treated. Liquid tight grease compartment for gears protect motor windings from any possible injury. Ball bearings are self oiling. The drill is made

PORTABLE ELECTRIC GRINDER.

in six sizes: 3-16, 5-16, 3-8, 1-2, 5-8, two speed and 3-4 inches.

The castings are made of aluminum and SKF ball bearings are used throughout.

The company has also developed a portable electric grinder and buffer along similar lines to the portable drill.

Both the drill and the grinder are herewith illustrated.

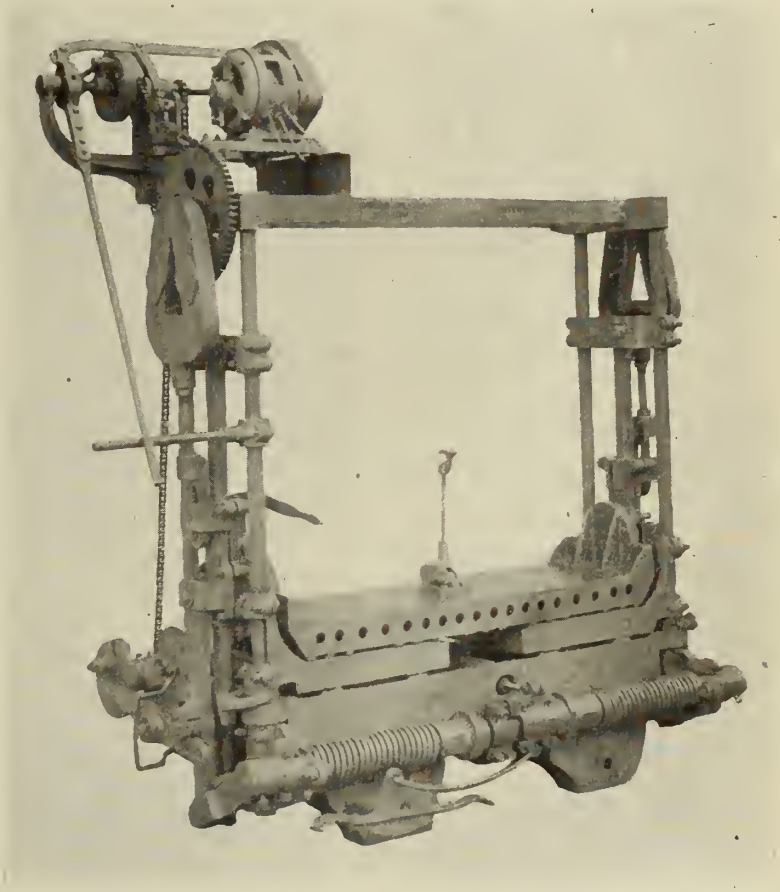
NEW ELECTRIC MOLDING MACHINE

The American Foundry Equipment Co., 366 Madison Avenue, New York City, have devised an electrically driven machine which embodies all the dominant features of the former machines.

An efficient electric drive applied to the established jolt—roll over—squeeze—pattern draw machine gives a piece of mold making equipment that not only makes the complete mold but relieves the operator of practically all physical exertion.

The electrically driven machine makes both cope and drag simultaneously within its normal capacity, and performs exactly the same steps, namely jolting, rolling over, squeezing, and pattern drawing, as its hand and foot operated predecessor.

Mounted patterns are attached to the cradle of the machine by hook bolts engaging between the battens. Flask sections are then placed on the mounts and sand shoveled in as usual.



MOLDING MACHINE, DRIVEN BY ELECTRIC POWER.

Jolting the mold is a power operation. The cradle and load are raised vertically, then dropped; this being repeated automatically until the desired density of sand is obtained. The speed of jolting, 100 to 120 times a minute, has been established after careful study. A more rapid jolt tends to agitate the sand and settle it less compactly, whereas with this machine there is a positive momentary period of rest between each jolt and the upward lift for the next impact.

A double-end foot lever at the front of the machine starts and stops the jolt motion by a clutch on the cam disc shaft at the rear. Large adjustable torsion springs counterbalance the weight of the cradle and load to any extent desired. A powerful expansion spring adds impetus to the jolt and prevents whipping or rebound.

Rolling over the mold is an operation consisting first of raising the cradle by power a suitable distance, then releasing its heavy locking pin and giving it a half turn by hand from the position shown in Fig. 3 to that in Fig. 4.

The table lifting motion is controlled by the clutch lever at the left end of the machine. It operates by sprocket and chain connection from the motor countershaft to a pair of pinions which are each in engagement with a novel heart-shaped crank head surmounting each of the two lifting arms of the cradle. Upon these crank heads reaching their highest position, a shift of the clutch lever stops the cradle in the position shown by Fig. 3. It is then rolled over by hand to the position of Figure 4. The two halves of the mold now hang from the under side of the inverted cradle.

Squeezing the mold is a power operation which immediately follows the rolling over. With the cradle still in the Fig. 4 position, the clutch is again thrown in and the heart-shaped crank heads allowed to make one full turn

(Continued on page 46)

Lighting the Cupola Without Kindling Wood

Coke Properly Placed in First Three Layers Permits Flame From Oil Burner to Penetrate Entire Area of Coke Bed, Thereby Ensuring an Even Lighted Fire.

THE idea of lighting the fire in the cupola by means of an oil burner is not by any means new, but is, nevertheless, in a somewhat embryo state as yet. Those who have adopted the system and become accustomed to its use claim that they would not use anything else and as it is in the line of modern foundry practice a short article on its operation will be read with interest by progressive foundrymen who have not yet had courage to forsake the wood pile.

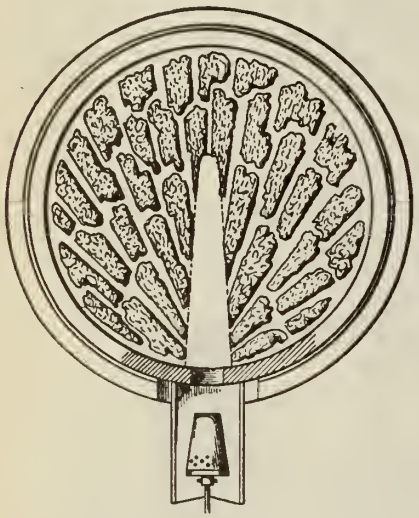


FIG. 1—SHOWING COKE PLACED IN PROPER POSITION ON SAND BOTTOM.

Most modern foundries are equipped with compressed air machinery, in which case it is small matter to instal the oil burning equipment, but where no compressed air is at hand a complete outfit which can be wheeled or carried about the shop is an invaluable acquisition to the foundry for various other purposes as well as for lighting the cupola. The device is much the same as the plumber's blow torch but on a larger scale, and instead of requiring refined gasoline as a fuel they will burn the cheapest grade of crude coal oil or distillate, with compressed air under almost any pressure. In lighting the cupola the air tank is placed in front of the cupola and the burner is placed in the trough in such a manner as to throw the blaze through the breast opening into the coke.

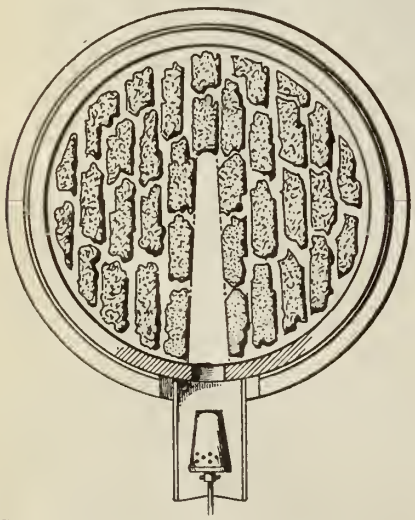


FIG. 2—Shows how second layer of coke is placed over the first layer, care being taken to keep the opening large enough for the flame to penetrate.

Preparing the Cupola

In preparing the cupola to be lighted with the oil burner in place of kindling wood very little change is made from the ordinary course of procedure. The sand bed is arranged in the usual manner. The breast hole which must be at least four inches wide and six inches high must be left open and instead of putting in the kindling wood the coke is put right on the sand bed, but this must be done in a proper manner for the first few inches.

The illustrations shown will practically explain themselves. In Fig. 1 will be seen how the first layer of coke should be placed. For small cupolas there is very little to fear but for cupolas above 40 inches in diameter build a tunnel four inches wide and six inches high, starting from the breast hole and extending about two-thirds of the inside diameter of cupola, as shown in Fig. 1. Use large pieces of coke about the size of an ordinary brick, allowing no less than one inch space between pieces to allow the flame to spread all over the entire area of the cupola. On top of this layer similar pieces of coke will be placed but in a manner similar to Fig. 2, lapping over the openings in layer Fig. 1. The openings in the second layer will of course be required the same as in the first.

The third layer will be cross-wise of the others and will cover the tunnel as shown in Fig. 3. On top of this the coke is charged just the same as in usual cupola practice.

Fig. 4 shows sectional view of how the first three layers will appear with the balance of the coke charged on top of them, also how the burner is placed in the trough. It is important that the burner be placed at a sufficient distance from the breast hole to prevent damage to the nozzle of the burner by reflected heat.

Tuyeres should remain closed during lighting to prevent counter drafts and opened when red spots appear around the tuyeres. The oil will then be shut off.

When compressed air type of burner is being used the air can be allowed to continue blowing after the oil is shut off and until the bed is lighted through, after which the breast hole should be closed and the cupola is ready to be put into blast and the remaining charges added. When the hand pump type is being used do not turn off the oil until the coke is thoroughly lighted, then open the tuyeres to produce draft.

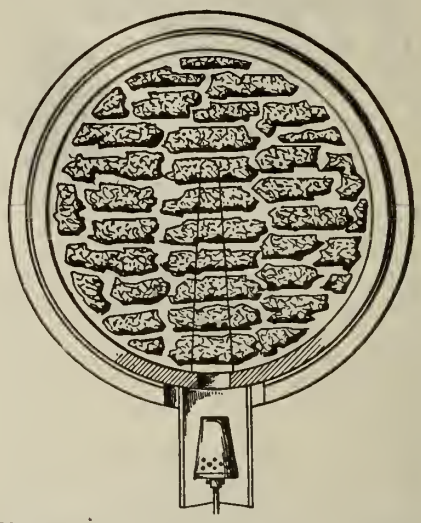


FIG. 3—Shows third and final layer of placed coke after which the remaining coke is charged in ordinary way.

Lighting Small Cupolas

Before closing it will be as well to explain that for cupolas under 42 inches in diameter the same course of procedure can be followed, but it is not necessary to go to so much trouble in preparing the first layers of coke. The usual procedure is to use an iron pipe or tapered log about three inches by six inches, inserted through breast hole ex-

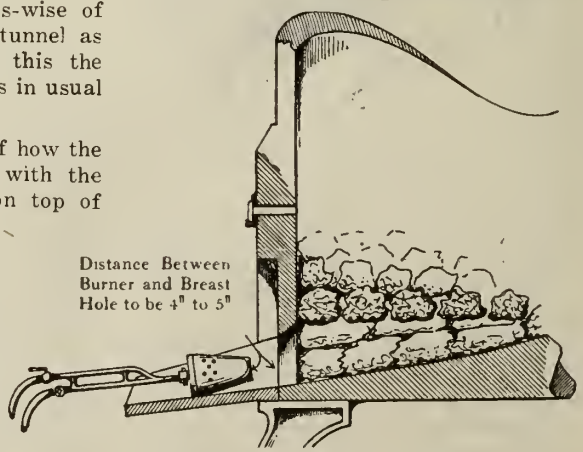


FIG. 4—Showing proper position of Burner placed near the breast hole when ready for lighting.

tending two-thirds of inside diameter. First place a thin board on bottom to prevent damaging sand bottom when removing pipe or log. This board can be left in the cupola to avoid blistering the bottom when the burner is started. Then drop large pieces of coke as in first layer, charging the balance of bed in usual manner. After removing log or pipe before lighting, pull out any pieces of coke which may have fallen and obstructed passage of tunnel, which otherwise might cause uneven lighting.

Other Uses for Oil Burner

In addition to lighting fire in cupola the oil burner is useful for drying ladles, skin-drying molds, retouching dry sand work, repairing damaged cores and innumerable other jobs about the foundry. In addition to the torch, burners are made for firing core ovens, steam boilers or any place where fire is required.

Letters to the Editor

WANTS CLEAN IRON

As subscribers to your journal we are taking advantage of your offer to give any information you can that may be of use to your readers. Would you advise us the different things that would cause dirt to get in castings, explaining how this may be remedied.

Answer:—With a clean mold and clean iron there would be no trouble in getting clean castings. If these cannot be assured we must get as near to them as possible and then so regulate the impurities that they will do the least amount of harm. Assuming that any good molder has sufficient intelligence to have his mold clean and well secured, we will devote our attention to the metal and the methods of gating and pouring. It must be remembered that all pure iron is the same and that the impurities which are added to its chemical content are what makes the different grades of iron. In melting iron these impurities are changed according to the manner in which it is melted. The hotter and faster the iron is melted the cleaner it will be and the nearer to the chemical analysis calculated upon. The base argument from which most melting experts draw, is that one pound of coke should melt ten pounds of iron.

Ten pounds of iron can be melted with one pound of coke, but nine pounds can be melted better, and eight pounds still better. Another feature in melting is the blast. It is not the blast which is required, but the oxygen in the blast, and it would be difficult to get too much oxygen to do good melting, hence the argument that too much blast burns the iron has little to its credit. If fuel is lacking and blast is used in its stead the blast will come in contact with the metal and injure it.

To attain best melting results use sufficient fuel to hold the coke bed 22 inches above the tuyeres and then have sufficient blast to penetrate through to the top so as to have combustion take place at its best at the surface of this coke bed. If the fuel is given too much to do it may melt the iron, and bring it down hot enough to run into the molds, but it will be dirty iron and neither skimming gates nor whirl gates nor any other kind of gate will prevent the dirt from entering the mold and making dirty castings. Flux will assist in removing the dirt and will make better castings but the metal must be properly melted in order to give the flux a chance. Skimming gates of various kinds are used to keep back floating dirt which accidentally gets into the pouring gate, but your molders will understand them. The usual skimming gate is made by standing a riser betwen the pouring gate and the pattern. A channel is cut in the coke from the gate to the riser and in the nowel from the riser to the mold. The iron in passing from the gate to the mold has to go down hill when passing the riser, and by having the channel in the cope cut bigger than the one in the nowel it is an easy matter to force the iron with the floating dirt up the riser, thus allowing nothing but clean iron to enter the mold. The whirl gate, instead of having the intermediate riser has a basin in the nowel between the gate and the mold. The iron enters the basin from the gate diagonally which causes it to whirl, thus throwing the heavy clean metal to the outside and automatically bringing he lighter material to the center. The basin is connected to the mold by a channel resembling a horn gate which draws the clean metal from the bottom of the basin to the surface of the parting in the mold from which it is cut into the mold.

WANTS INFORMATION ON BUILDING NEW FOUNDRY

Editor Canadian Foundryman: We have now decided to rebuild the small foundry which was burned down during last autumn. Will you please tell me what would be the best dimensions for a building employing four or five men.

Is it preferable to make the floor of cement or only of a good loamy clay?

We intend building with cement blocks and making these blocks ourselves. Could you please tell me where we can procure the molds necessary to make these blocks?

Answer.—In building a foundry there are a number of things to be considered. A square building has more floor space than is possible with any other design, using the same amount of building material, but a square building does not make an ideal foundry. Posts for holding up the roof make a cheap make-shift but are in the way, so avoid posts if possible. A narrow building with a steep roof can be built the most substantial and economical and makes the most desirable shop in many ways. For a staff such as you mention, I would suggest a building 35 feet wide and 50 feet long. Any smaller than this would be too small to be profitable, and any larger would not be required. By putting a 5-foot gangway along one side, each molder would have a floor 10 feet by thirty feet, which is the generally adopted rule. I could not recommend walls less than ten feet high and would prefer twelve feet. I would pitch the roof at an angle of 45 degrees and would put a good ventilator the entire length of the roof. Anything in the shape of a dog-house annex is not to be recommended, but the rumblers and emery wheels should not be in the molding room. An extension twelve feet wide and running the entire length of the building provides ample space for cupola, mill room, grinding room, power house, and carpenter shop.

Regarding the concrete floor, I would refer to the article in this issue in connection with the McClary improvements in Brantford. It is certainly the right idea to have a perfectly level concrete floor. Big corporations do not spend money unless it yields dividends and if it pays the big corporation it pays anybody. If pit work is going to be a possibility a pit can be built of concrete.

Regarding the molds for making the cement blocks, we will insert a request for information on this and will forward you the replies.

PROTECT WORKMEN'S FEET

One drawback to the foundry which every foundryman is well acquainted with and which should be given much more consideration than is accorded it, is the risk of burned feet. It is doubtful if anyone ever serves out as much as his apprenticeship in a foundry without getting melted iron or red hot sand in his shoe, and knowing this, no pains should be spared to secure proper shoes so as to insure the utmost protection against this most distressing feature of the business. The practice of wearing laced shoes which have been discarded from Sunday service, may be looked upon as economical but it is far from it. The only shoe which should be worn is the regular molder's gaiter with good elastic sides which keep tight at the top while affording all the ease and comfort of a laced shoe and none of its bad qualities. From a "safety first" standpoint it is essential that the foundry operative start from the bottom when fitting out with protective apparel, and purchase nothing but the best. Gaiters on purpose for molders are on the market.

The Savoie-Guay Company, Plessisville, Que., manufacturers of one-man motor plows, writes: "Enjoy reading your journal which is full of valuable information of all kinds."

The American Malleable Castings Association

Aims of the Association—Requirements of the Customer—Necessity for Uniformity—Research and Various Tests—Samples of Castings Put to Severest Tests.

SOME years ago it was realized by a number of the leading manufacturers of malleable iron castings that the industry as a whole was not advancing along metallurgical lines as rapidly as the extent and variety of its output demanded. Its prestige was being injured to some degree by the non-uniformity of its product; and the consumer was not deriving the full benefit, to which he was entitled, from the use of this character of material. An investigation brought out the fact that each individual company was working along its own lines, and jealously guarding its secrets. Many plants were still operating, to a large extent, "by rule of thumb," and what research work was being done was carried on in a more or less haphazard manner.

This Association deemed it expedient that the industry take up the research feature of its product and employed a metallurgical expert to do this work. The bars of secrecy were let down and co-operation became the order of the day. Each step in the process was carefully investigated and through visits to the various member companies the faults were eliminated and the product improved to a marked degree. Daily tests were, and still are, made of the iron produced by each company and a uniformly high quality of output was demanded as the prime qualification for membership.

These changes were not made in a day nor in a year, nor is it believed that further improvement is impossible, but many difficulties have been overcome and the results obtained are evident.

The Association early adopted the well-known "wedge test" as its measure of quality. This test is as follows: A cast wedge six inches long and one inch wide, and tapering from a thickness of one-half inch at one end to one sixteenth inch at the other, is poured from each regular heat. It is subjected to repeated blows of seventy foot-pounds under a specially designed hammer, while held upright on its larger end. The metal "curls" during the test as is shown in the illustration, Fig. 3, and if no fracture develops before it has received 20 blows, it is considered as having met the specification. However, it was not very long before improvements which had been made in the process began to show such striking results that it was decided that the wedge test was not of a severe enough nature to be a true measure of the quality of malleable iron.

About this time, also, demands were being made on the industry for a product that would consistently pass a test based on the tensile strength and elongation. The standard specification for malleable iron of the American Society for testing materials then called for a tensile strength of 38,000 pounds per square inch and an elongation of 5 per cent. in 2 inches. This, it will be agreed, did not put the material on a very high plane and the Association bent its energies toward developing a product that would easily surpass these figures.

Standard five-eighths-inch test bars were made daily by each member from his regular heats and submitted to the metallurgist for test. Exhaustive investigations of the failures were carried on, ovens and furnaces were redesigned, temperature control apparatus was installed and finally the Association was able again to report progress. Careful records of these tests have been kept

FIG. 3—TEST WEDGE AFTER RECEIVING SUFFICIENT BLOWS TO BREAK IT, THUS DEMONSTRATING WHAT ITS REAL STRENGTH IS.

and the improvement made can be shown by the following figures.

In November, 1915, of all the bars submitted for test 5.79 per cent. failed to reach 40,000 pounds per square inch, tensile, while only 4.18 per cent. of all the bars exceeded 52,000 pounds. In December, 1918, the latest figures available at this writing, only twenty-five hundredths of one per cent fell below 40,000 pounds, 97.54 per cent exceeded 44,000 pounds and 39 per cent. tested over 52,000 pounds per square inch, with an average elongation of 14.38 per cent. in two inches. These last figures give the result of tests made in 1257 bars.

To further illustrate what is possible of accomplishment, we give below the record of a run of 24 successive heats.

First Lot—Twelve Bars

Average ultimate strength, lbs...58,493
Average elongation, per cent 22.91

Second Lot—Six Bars

Average ultimate strength, lbs ..58,033
Average elongation, per cent 18.12

Third Lot—Six Bars

Average ultimate strength, lbs...57,371
Average elongation, per cent..... 23.83

The average ultimate strength of the 24 bars is 57,969 pounds per square inch and the average elongation, 21.62 per cent., but while these results should be considered unusual they show what may be done in special cases.

In June 1918, the American Society for Testing Materials tentatively adopted specifications for malleable iron calling for 45,000 pounds tensile strength with 7½ per cent. elongation in two inches, at the request of the Malleable Iron Industry.

It is not to be supposed, however, that this improvement in metal itself has been made at the expense of other qualities which contribute to the value of the casting, as a casting. Experiments have been conducted to develop soundness, machining qualities and finish. Chills have in a measure given way to proper proportioning of gates and risers so that voids due to unequal cooling of the molten metal are corrected rather than disguised. Hard scales have been eliminated by proper selection of packing materials and proper protection during the heat treatment. The sand blast has displaced the tumbling barrel where an absolutely clean surface with exact preservation of contour are necessary. In short a sincere effort is being made to give the consumer what he wants and has a right to demand.

NEW CATALOGUE

The Graton & Knight Mfg. Co., Worcester, Mass., have issued a very interesting book dealing with their lines of standardized leather belting for power transmission. This bulletin is numbered 101, and is done up in very attractive style. The book consists of almost 100 pages and is well illustrated throughout.

After the various lines have been discussed and their qualifications stated, the remainder of the book is filled with real live information for anyone using belting. Data of considerable value is given, in fact the latter portion of the book is a small text book in itself.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—I would like some information regarding the adaptability of concrete tanks for nickel plating purposes. I understand that nickel solution will penetrate where water alone will not, and that the crystallization of the liquid eventually creates havoc with the container at the point of leakage. If this is true, would not the concrete prove less durable than wooden tanks protected within by asphaltum?

Answer.—Concrete tanks, if properly built, are superior in all respects to any other kind of tank for nickel-plating purposes. They do not rust or rot. The concrete mixture should be in proportions, one part Portland cement to one and one-half parts clean but rather fine sand to three parts screened gravel or finely broken stone. A tank in order to withstand the action of the solution and not leak, should be built by laying the concrete without stopping. Even then there are other essentials which, if disregarded, will produce leaky tanks. The concrete must be mixed so wet that it will flow over and around the metal reinforcements and against the forms. The materials for the concrete must be very carefully proportioned and the stones small enough to pass a ¾-inch mesh screen. A concrete made by using a very clean screened gravel is denser than a concrete made with broken stone. It flows into place better and is not so liable to have voids and stone pockets which let the water through. Square tanks do not stand water pressure so well as round tanks because the sides tend to bulge, but they are all right if not more than 4 feet deep and 8 feet long, or deeper tanks may be set in the earth or an extra heavy base built to strengthen the sides. Build outside forms 12 inches wider, 12 inches longer and 6 inches deeper than the inside of the finished tank. Set mesh reinforcements, or else ¼-inch rods running both ways and 6 inches apart, in bottom of tank and 9 inches apart in the sides. Allow the vertical rods to project down into the bottom and the bottom rods to project into the sides. Tie horizontal rods to vertical rods by 1-16-inch soft wire. Place the inner form 4 inches from the outside form, this form can rest on iron pins driven into the ground. Grease the forms thoroughly. As the concrete is placed in the bottom, lift the reinforcement a little to allow the concrete to get under it. When filling the wall, use care to keep the reinforcement in place. By working carefully the inside form may be removed as soon as the concrete has become dry on top, say, in two or three hours. A better plan is to leave it for two or three days and knock the form to pieces. Leave the outside form in place for three or four days. After the concrete has set and the forms are removed, paint inside of the tank with pure cement mixed with water to the consistency of cream and brush in well. This should prevent leakage, but it is advisable to season the cement by wetting it two or three times per day for at least one week after removing the forms, and do not fill with solution until tank is two weeks old. Acid solutions are injurious to green concrete, but after proper seasoning it is proof against injury. Thin walls to concrete tanks for any purpose are liable to prove troublesome even when built in warm buildings, because concrete expands and contracts with changes of temperature just like other materials. If you object to the natural surface of the concrete being exposed to the solution you may cover it by coating with asphaltum as is the custom in preparing wooden tanks; the asphaltum may be either ironed smooth or smoothed by means of a blow-torch. We may add that the thickness of concrete here given is only required to imbed the reinforcing steel and to make the tank watertight, and should vary with the height of the tank, but not necessarily with the diameter.

THE AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1920-1921.

President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

Question.—I would be grateful to you for a formula for blueing steel. I wish a rather bright blue color and a coating which will protect the steel from rust to some extent.

Answer.—If your steel goods or parts to be treated are small, tumble them in sawdust until quite clean and bright. In any event, the surface of the steel must be uniformly clean and, if bright, the finish will be better. Unclean surfaces will result in streaks, spots or mottled effect. Wash the steel in strong, clean alkaline solution for final cleansing, then immerse in a hot solution of the following composition:—Water, 1 gallon; sodium thiosulphate, 2½ oz.; lead acetate, 2½ oz. The colors run from golden to red and finally blue in only a few seconds, and to ensure best results the operation must be carefully watched and the articles removed at the proper time, which is when the blue color becomes quite clear; longer immersion causes a grey or blackish color to form. In order to obtain greater protection from corrosion the articles may be either brass or copper plated in a bright plating solution, and the blue color produced as a final finish. After blueing, rinse well, then immerse in a hot water bath containing 4 oz. of white gelatine per gallon of water. Dry in drying chamber or by compressed air.

* * *

Question.—Kindly inform me how I can prevent the formation of cloudy films on highly polished brass surfaces, after washing the polishing compound stains off.

Answer.—Firstly, a good polishing or buffing compound will leave no stain on brass surfaces. If after washing the brass, there is a noticeable tarnish, the article is rinsed in clean running water and immediately immersed in a solution of cream-of-tartar (5 oz.), and water (1 gal.). To dissolve the chemical, heat the water, but when used as a dip it must be cold to yield best results. Dry in fine hot sawdust, direct from the dip without rinsing. This solution is very effective for the removal of the brownish mottled stain which usually is seen on brass which is rinsed and dried direct from the bright acid. In this case the cream-of-tartar treatment follows the second rinsing after acid dipping. Brass surfaces subjected to this treatment will remain uniformly bright for a great length of time, while brass which is not so treated will tarnish badly very quickly.

* * *

Question.—The superintendent of the factory where I am doing the plating wants me to try out hot nickel-plating. I have no instruments, such as voltmeter, etc., and have no idea how hot the solution should be used or what it should contain. Shall be thankful for any little help you can give me.

Answer.—Your superintendent is taking the right course by requesting a trial of hot nickel plating, but he must equip the tank properly if he wishes satisfaction. It is bad enough to operate a cold solution without proper measuring instruments, the operation of hot solutions without instruments would be much more difficult. Get a voltmeter, ammeter and a crown rheostat large enough to carry the current you will use; also get a hydrometer, thermometer, and a few books of litmus paper. Make the nickel solution by dissolving 2 parts single nickel salts and 1 part double nickel salts in sufficient water to make the volume required. Add 3 oz. magnesium sulphate and 3 oz. boric acid per gallon of solution. Operate at about 150 degrees Fah. The solution will increase in electrical conductivity about 2 degrees with a rise of 1 degree in temperature. Filter the solution when it becomes foul.

Statuary Molding—the New or French System

Describing the Process of Making a Hollow Bronze Statue From a Solid Plaster Model, Featuring the System of Draw Backs of False Cores.

By H. T. ALLEBAUGH

EDITOR'S Note.—In our last issue we showed a bronze statue cast in one piece many years ago in a mold which was made by what was termed the wax process, in which the core was first made the same as any core of ordinary core mixture. This core would be of approximately the shape of the statue. Over this would be placed sheets of wax of proper thickness for the castings. This wax would be pressed tight into every detail of the core, after which the sculptor modelled the wax to the exact design required. Around this a solid mass of masonry was built. This might have been brick and loam or just mud, so long as it covered the model. A pouring gate was provided near the top and all necessary vent holes were carefully looked after. When all was ready the mold was heated up to a sufficient temperature to not only dry it but to melt the wax which ran out of the bottom, leaving a space between the core and the outside masonry of the exact design required for the statue. This method called for a high degree of mechanical skill combined with artistic ability, a combination which few men possess. The workman has to be a highly imaginative genius, an artist, a sculptor, and pattern and model maker as well as a molder and founder. A complete story of the process would undoubtedly be of interest, but enough has been shown to give the reader a fairly good idea of how it was done. In this issue we endeavor to show how this work is now being done.

In Toronto we have an industry known as the Architectural Bronze and Iron Works, where a specialty is made of heavy bronze vestibules, revolving, sliding and hinged doors, staircases, elevator entrances, clock towers, and numerous other articles of like order. This establishment has a good sized iron foundry which will be passed by on this occasion. It also has a brass and bronze foundry equipped with a battery of six Rockwell oil-burning crucible furnaces, one Rockwell 10-cwt. oil-burning tilting furnace and one 18-cwt. tilting furnace, also a Rockwell, two cranes and all the other accessories which contribute to the make-up of a bronze foundry. The line of work for which this plant was built makes it admirably adapted to the production of bronze tablets and statuary.

Since the outbreak of the war this line of work has been rapidly gaining in popularity, with the result that the company has gone extensively into it. Many beautiful tablets bearing the honor roll of the various churches and societies have been turned out during the last few years. The bronze statue which finds a place in the parks and public buildings is also in demand.

In the photographs here reproduced will be seen the molding and pouring of a statue of a fallen hero. This is done by what is to be described as the French process, in which the pattern is literally covered with cores made of French sand imported for the purpose. These cores are all built right in their place, up against each other with partings between them at the proper angle

BRONZE STATUE JUST AS IT WAS TAKEN FROM THE SAND WITH CHAPLETS AND A FEW FINS TO BE TRIMMED OFF. NOTE ONE ARM AND ONE HAND WHICH WILL BE ATTACHED.

to allow each one to be drawn in the direction which will be required to free it from the model. These cores are all struck off on the back making the entire mass somewhat resemble the back of a turtle. The cope is rammed over this and when lifted off the cores have to be removed before the pattern can be drawn. When the cores are replaced the cope is closed on to them, holding them in their place. This is just a short synopsis of the process. By carefully following Mr. Allebaugh's story any molder who has his mind on his work should be able to mold bronze statuary. The process as described by Mr. Allebaugh, foreman of the bronze department of the foundry, follows:

The New System

The new system, also called "the French system," is not entirely new, since it is followed nearly everywhere with but slight modifications.

It is based on the following principles:

To keep the pattern, whether it be made of metal, plaster, wood, wax, or any other material able to bear handling, during the whole operation; to cast in flasks and in sand, and to cast a statue, for instance, in as many pieces as is needed, and to unite them afterwards to make up the whole.

Some People Object

A great many objections have been made to this mode of piecing, and we will indicate some of them in order to refute them. It has been said that no such skill is needed for casting part of a statue as for a whole one. That is true; but what is the advantage of a more skillful and difficult operation, if the results are not superior, and the costs and risks are greater?

In the old process by wax, the castings were generally inferior in soundness to those made by the new process. An accident to a portion of the work was often sufficient to cause the loss of the whole casting, and besides no pattern was left.

In the new method, an accident to the part is more easily repaired by burning or otherwise; and, if no repairs can be made that part only is begun anew, with the preserved pattern.

The other great objection are the numerous seams to be seen at the junctions of the different parts, the difficulty of making these parts agree when brought together, the supposed lack of strength at the joints, and the greater labor in finishing. To this we answer that with the precautions which we will indicate later on, these seams can be made invisible. The parts will agree when brought together, if there is no giving way of mold or core, and this is more easily obtained with small than with larger pieces. The joints are not so strong if pinned or screwed as if they were solid casting; but we will show, in explaining the process, that they can be made strong enough, and more, for all purposes. As for greater labor in mounting and finishing, it has not been proven so. The time spent in pinning and screwing the pieces together is more than counterbalanced by the gain in general repairs, since the different pieces are generally sounder than if the whole statue, for

instance, had been cast without joints.

There are some other advantages in the "French" process:

The casting in sand gives better impressions, the mold and cores are more easily dried and repaired if need be, the transportation of the larger castings is more easy in pieces than in whole, the thickness of the castings is more easily regulated, so that some of the largest of equestrian statues may not be over ¼ inch in thickness of metal. It is quite sufficient to put the most metal where the strain is greatest.

In the Foundry

I will now endeavor to explain the practical process itself, and will suppose that we have to mold and cast a large statue.

The pattern sent to the foundry is generally of plaster of Paris. It may be reproduced whole in sand, but the operation will be difficult, and the casting sometimes less sound than if made in parts. Moreover, the flasks and cranes will need to be of such dimensions that few founders will be able to bear the expense of such a plant. We have then to divide the model in the most favorable manner for molding and finishing.

There are no general rules; but, if practicable, the divisions will be made at the junction of the flesh and draperies, or at a seam, a belt junction. If, on the other hand, the dimensions of the flask, a better disposition of the cores, or any other condition requires the cut to be made somewhere else, it is made there, and the junction will be hidden afterwards when mounting the piece.

When the foundryman, after a thorough examination of the model, has determined the places at which the cuts are to be made, he proceeds to do so with a keyhole saw, or fine twisted wire that will adapt itself to curved surfaces, and the cutting away of the plaster is quite rapid.

The next operation consists of providing the portions of the pattern thus cut, with the different tenons and mortises needed for fastening the various castings together. Thus, the pattern, if not already hollow, is hollowed out for the mortise, and a plaster tenon added to the corresponding piece, a neck or arm, for instance. The joints of the tenons and mortises must be made to fit as near perfect as possible.

The flasks used in statuary work are generally of large dimension, are made, as a rule, of cast iron, and have a very near resemblance to those used in cast iron foundries. The metal is perhaps thicker, the joints are planed, and the pins and fastenings are made with more care, for the sake of greater accuracy. The up-to-date flask is made interchangeable, and the trunnions being cast on each section make it possible to roll either sideways or lengthways.

In this class of work, it is difficult to preserve the difference between the drag and the cope, since both are alternately one and the other. We shall, therefore, call both of them copes, since the outside reproduction of the model is made in them. The core will be, as usual, the representation of the hollow inside of the model, and, by contradistinction, we shall call "false cores" the separate sections or pieces of the mold made on the outside of the pattern.

For beginning the molding work, we bury the model in the flask at the line of the division of what would ordinarily be the cope and nowel. But in this case we do not separate our mold at the center line, but at the most convenient place for the making of the false cores, or drawbacks as they are commonly known. For instance, if we are molding the trunk of the body of a man, it may happen that the disposition of the draperies or of the arms will make it more advantageous to dispose the model slantingly or sideways instead of on its back. The supporting body of sand need not terminate in a plane surface, flush with the top of the flask; on the contrary, it is raised or lowered to follow the configuration of the model in the direction most suitable to the work. The only condition required of this unequal surface is, that there should be no undercut portions to prevent the smooth union or separation of two joints

When we have finished the operation of burying the model, or "making the bed," to use the more common expression, the sand is then all smoothed, pressed, and plenty of parting rubbed into it.

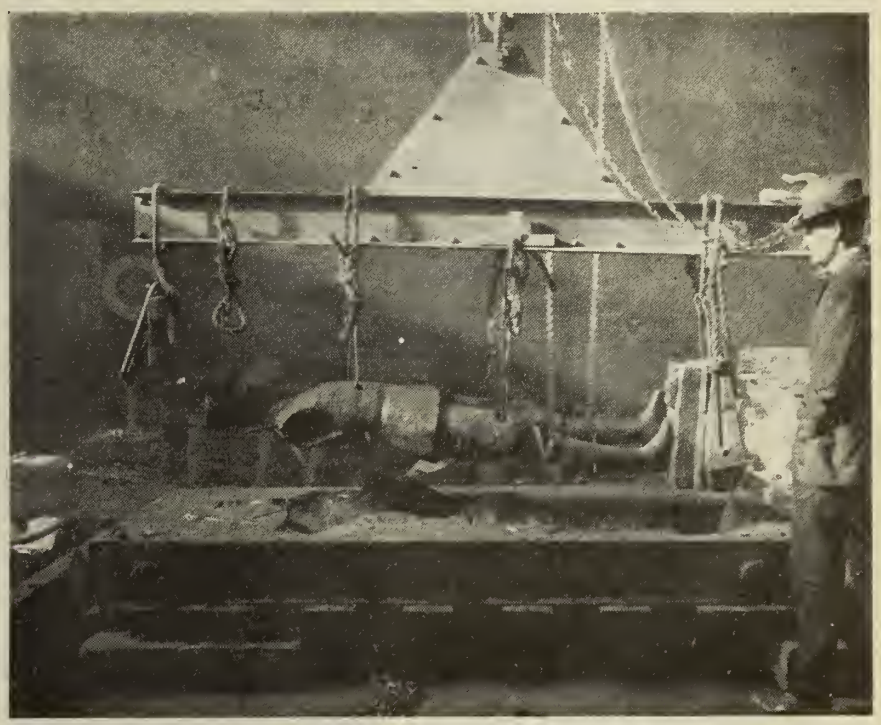
The Real Molding

Now begins the real work. The rule is to begin by the hollows on the surface of the model, and, when the work allows it, to start from the surface of the flask around and up the pattern, like a bricklayer or mason building an arch over an irregular shaped vault.

The False Cores or Drawbacks

This covering up of the pattern by a greater or less number of false cores is sometimes very difficult when the recesses are deep and do not deliver. For instance, let us suppose that the fold of a drapery resembles about one-half of the figure 8. The sand rammed into it cannot be removed from the contracted part. If the curve enlarges sufficiently above or below, it may be possible to slide the false core out. The best plan is to lay a piece of paper against one half of the curve, and ram a false core against it, thin enough to pass through the opening. After making the joint of the core sufficiently hard to ram another against it, place another piece of paper against that core and ram or fill the cavity with a new quantity of sand. We have then two different false cores, one over the other, and we are still in about the same predicament as before. But in this case we may cut where the opening is largest a small portion of one of the superposed false cores, and by pulling the paper out from between and placing a large needle, made especially for that purpose, in the back of the false core, withdraw it.

This leaves an opening through which the other parts of the same false core may be slid out whole or in parts. These same false cores are often so small and so thin that they require the greatest care and skill in handling. As soon as they are removed from the model they



CORE BEING PUT IN PLACE. FALSE CORES OR DRAW BACKS WILL BE PLACED AROUND THIS TO FORM THE OUTSIDE, AFTER WHICH THE COPE IS CLOSED UPON THEM.

are pasted together and pinned with iron wires to the larger false cores made in sections of a size convenient to handle by hand, providing of course that the job in hand does not call for the making of larger false cores, in which case it is necessary to use the crane. As the cores have to be handled quite frequently, they are reinforced with iron arbors or frames with eyes distributed in convenient places to insert hooks made for that particular purpose.

It is very necessary that the joints of the larger false cores be made with great care and smoothness to insure a good fitting mold when they are put together after the model has been removed.

The Gates

While the false cores are being built up the founder disposes the openings or gates for the running of the metal. This operation requires a great deal of judgment and practice on the part of the foundryman, as it is considerably influenced by the shape of the model. However, as a rule, it is preferable to have small and numerous gates than less number of a large size. The gate is usually three or four times as wide as it is thick and the thickness should not be over that of the intended casting.

The main runners or feeders are larger of course and are generally built on the outside of the large false cores; for instance, where the main cope separates, branches often running all over the cores, wherever necessary.

For facilitating the finding of the proper places of the various false cores, when after being removed from the model, they are again put in position, the joints are dovetailed or marked with warts or hollows, which reproduce afterwards corresponding hollows or warts on the reverse joints.

We have now arrived at the point where the model is covered, on the upper half, with false cores. The upper flask is now put in place. But, before we ram any sand into it, we cover the false cores with newspaper or any kind of paper that may be easily pasted on the surface when the flask is to be lifted from the core. When that is done we ram the flask up, of course maintaining our sand with iron jaggers suspended from traverse bars or other bars bolted on to the sides of the flask. The two flasks are then turned over, the upper flask or cope No. 1 becoming the lower one, and conversely. The bed in which we laid our model is then removed.

This second half of the model is treated practically the same manner, except that we do not make our large false cores as we did on the first half. Instead of that, we ram it up in the cope and lift off, filling in any undercuts, of course, with smaller false cores which are nailed into the cope after it has been taken off.

When we have taken this cope off, and all the small false cores are removed and placed in their respective places on it, and all repairs made that are necessary, and any gates that are to be placed, cut, this cope is then blackened with a thin coat of the best wet plumbago and laid aside to wait until we are ready to make our inside core. Its use in that connection will be explained later.

Preparing for the Inside

The molding proper now being finished, we must prepare to make the inside core. Of course, you discover the No. 1 cope has not been spoken of since it was built. We will come to that later.

In order that an inside core be made, we must have some way of getting the reverse side, as the front is made in the mold in which the large false cores are laying on No. 1 cope. They, you understand, have not as yet been removed.

We will proceed, then, to make another set of cores where we rammed our last cope. These cores are made in sections of a size convenient to either ram under or to be used in printing the reverse side of the inside core (after sufficient bearing rods and arbors have been built inside of the mold to sustain the core when we cast, taking care to place iron pipe of a size large enough to carry the vent, this iron pipe being drilled with holes to allow the gas to escape through the sand covering it).

When we have made our sections for making the reverse side of the inside core, we take them off and lay them to one side to await their turn, after painting them with plumbago to preserve them.

Now that our cope No. 2 is all done, we put on another flask, fill it with sand rammed just enough to allow of no sagging and roll the whole mold over again and lift off No. 1 cope, which, by the way, never goes in the oven, as it has none of the impression of the model on it, that being taken care of by the large false cores which will now be removed from the model repaired, painted and set to one side to wait their drying sufficiently to allow handling again. When all the false cores have been removed from the model, it is then dispensed with, and the flask in which we rolled over the last time is dumped out and set to one side to wait until the inside core is made.

Now we are all ready to make our inside core.

Making the Inside Core

We take cope No. 2, place it in position to roll on the floor and then take the false core that was made first, and set it on the joint in its place, when each one has been put in place, each core having been built one against another in order to allow them to be put together in rotation, put your cope No. 1 on and roll over again, lift off No. 2 cope—and then you will be all ready to make your inside core.

Your mold is now back in the position it was when you made your last false cores, which will give you the impression of the reverse side, of which we have a true mold in cope No. 2.

The mold now being ready for the core to be built in it, we proceed to place the core irons, supports and vents. When all is ready we ram the mold full of sand of a quality strong enough to allow handling, and that is all (molding sand) when the core is all rammed, and the last false cores put on to get the impression of the reverse side, these false cores being taken off again. The reverse side is now before us in sand instead of a plaster model.

The molding of the real core is now

POURING STATUE. SIXTEEN CWT. OF BRONZE WAS MELTED IN OIL-BURNING FURNACE AND POURED INTO CRANE LADE. CONSIDERABLE METAL IS HELD IN THE HEAD AND DRAWN OFF AS SOON AS POURING IS DONE.

finished upon flask No. 1; one half is inside of this flask and the other half outside.

We now proceed to pare down to the dressed thickness of metal, by scraping enough sand from its surface by means of a steel tool shaped for that purpose. When the upper half of the real core is shaved or scraped to the desired thickness, we then ram up the flask that we had when we rolled our model over for the last time. When this is done we roll over again, lift off cope No. 1 and proceed to take the large false cores away from our inside core, which has taken the place of our model, and when this is done, the core shaved or scraped, and the mold repaired, it is ready for the oven.

When it is baked sufficiently, it is then taken out, the core is placed in its bearings on the No. 2 cope—the false cores are set around and over it, the No. 1 cope

H. T. ALLEBAUGH.

set on, bolted down and it is practically ready for the metal.

Mr. H. T. Allebaugh is an American by birth, and is a statuary molder and founder by profession. He served his apprenticeship with the Gorham Manufacturing Co., of Providence, R. I., and remained with that company for twenty-five years. During his stay at this establishment, which is among the largest of its kind on the continent, he had experience on many of the noted statues which adorn the parks and public buildings of the United States and Canada. Among the important pieces of statuary turned out of this plant during Mr. Allebaugh's time might be mentioned those in connection with the Bell memorial at Brantford, Ont., in commemoration of the invention of the telephone, which took place in that city.

Shortly before the outbreak of the war, Mr. Allebaugh severed his connection with the Gorham Company to take charge of the J. W. Feeley, Church-Plate, Tablet and Art Co.'s foundry, of Providence, but on the entrance of the Americans into the conflict he severed his connection with this company and enlisted in the navy. After the signing of the armistice, he felt the same inclinations which characterized so many of the returned warriors, viz., that of unrest, and instead of returning to his home town, and settling down to the old routine he yielded to the impulse to travel, and having formed a most favorable opinion of Canadians on account of what he saw of them in connection with the war, he visited the "Land of Promise." His first task here was that of starting the art foundry of the Wm. Rodgers Co., King Street West, Toronto, and after seeing it safely through and a good man installed, he accepted his present position with the Architectural Bronze and Iron Works, on the first of February, 1920, which position he has filled with marked success.

TOO SLOW

By the Editor of C. F.

Perhaps the readers of a newspaper know how much trouble it is to get the material together to make up the paper, and then again perhaps they don't, and to enlighten those who do not I will explain that in the case of a foundry paper it is necessary to make persistent calls at the different foundries and get pictures and whatever information can be picked up. Some foundry superintendents are glad to see us and will go to unlimited trouble to be of assistance, while in other cases it is not such smooth sailing. A short time ago I got wind of some good work being done in a certain foundry and I also learned that a new superintendent had been appointed and that he was a capital good fellow. This was all good news to me, so I bethought me that it would be a good plan for the editor himself to make the acquaintance of such an amiable gentleman and forthwith I made a personal call. I found the superintendent everything which I had anticipated and then some.

In order to introduce myself I tendered my card, and as soon as his eyes fell on its contents he fell all over me and said he read my paper every month. He then proceeded to show me all over the shop and pointed out many things which he thought would be of interest. After we had gone the entire round, and I had formed my opinion of him and his ability, I thought I would find out his opinion of my efforts as an editor, so I concluded to ask him a straight question without any loopholes in it, so that he would have to answer one way or the other, so I said: "What do you think of "Canadian Foundryman?" Without a blush, he looked me in the face and said, "too slow." After watching my lower jaw settle down an inch or two he proceeded with his discourse, saying, "They don't want to spend any money and if they don't put money into a business they can not expect to take much out." My jaw kept receding until he arrived at the point in his discourse where he was explaining that he had not seen one that was anything like properly equipped and that if approached on the subject of better equipment, the manager brought up the subject of too much expense, etc., and then I discovered that I had been misunderstood. He was talking about Canadians who operate foundries. He was an Old Country molder who had spent his younger days in his native land and had also spent some years in the United States, and finally settled in Canada, and this was his impression of Canadians, as he saw them in connection with the foundry. I did not press him further for fear that I would hear what would not be appreciated, but I concluded that if this was the opinion of this British-American mechanic, why not investigate the matter and if others can make headway by spending money on equipment why not go into it a little more extensively in Canada and see if we are not just as capable as any other nation. We have some splendid institutions in this country, but we undoubtedly have a goodly number which are not as modernly equipped as they should be. Since we know how outsiders view our foundries it is to be hoped that we will modernize as rapidly as possible.

SAND BLAST CASTINGS DEMANDED

The following article, while savoring of boost, treats on one article of foundry equipment, and if it is backed up by facts it should not be loked upon as a boost. As has been frequently pointed out, each article of equipment has its special field, and the sand blast has a field distinctly its own, and is not in opposition to the tumbling barrel or any other machine.

Loss of three of its principal accounts recently threatened a Pennsylvania manufacturing company, by reason of new specification demands.

It came like a thunderbolt—there had never been complaint of quality, no question of price or deliveries—but these three customers, taking the bulk of the plant output, demanded that future deliveries be sand-blast cleaned and finished, or their business would go elsewhere.

There is hardly any process in the metal working industries that can't be improved or cheapened by a properly selected sand-blast. If you think there is none in your business, let an engineer go over conditions with you and find out.

1921 is going to be decidedly a "buyer's market." Your customer may not give you notice and then wait for you to install. Beat him to it. Clinch his trade and attract more.

A sand-blast intelligently selected and adapted to individual needs is not determined and installed in a day or two.

Laying Out Gearing and Making Gear Patterns

Laying Out Involute Tooth by Means of Odontograph Table, Also Tables and Charts for Laying Out Epicycloidal Teeth.

By H. J. McEASLIN

IN practice these theoretical curves are rarely laid out, approximates being used which are obtained by means of circular arcs. The radii for these circular arcs are commonly obtained from odontograph tables. In Grant's work on Gearing, he gives an involute odontograph table from which radii for various sizes of gears can be obtained. Fig. 4

GRANT'S INVOLUTE ODONTOGRAPH.

STANDARD INTERCHANGEABLE TOOTH, CENTERS ON BASE LINE.

Teeth	Divide by the Diametrical Pitch		Multiply by the Circular Pitch	
	F. Face Radius	G. Flank Radius	F. Face Radius	G. Flank Radius
10	2.28	.69	.73	.22
11	2.40	.83	.76	.27
12	2.51	.96	.80	.31
13	2.62	1.09	.83	.34
14	2.72	1.22	.87	.39
15	2.82	1.34	.90	.43
16	2.92	1.46	.93	.47
17	3.02	1.58	.96	.50
18	3.12	1.69	.99	.54
19	3.22	1.79	1.03	.57
20	3.32	1.89	1.06	.60
21	3.41	1.98	1.09	.63
22	3.49	2.06	1.11	.66
23	3.57	2.15	1.13	.69
24	3.64	2.24	1.16	.71
25	3.71	2.33	1.18	.74
26	3.78	2.42	1.20	.77
27	3.85	2.50	1.23	.80
28	3.92	2.59	1.25	.82
29	3.99	2.67	1.27	.85
30	4.06	2.76	1.29	.88
31	4.13	2.85	1.31	.91
32	4.20	2.93	1.34	.93
33	4.27	3.01	1.36	.96
34	4.33	3.09	1.38	.99
35	4.39	3.16	1.39	1.01
36	4.45	3.23	1.41	1.03
37—40	4.20		1.34	
41—45	4.63		1.48	
46—51	5.06		1.61	
52—60	5.74		1.83	
61—70	6.52		2.07	
71—90	7.72		2.46	
91—120	9.78		3.11	
121—180	13.38		4.26	
181—360	21.62		6.88	

Draw the rack tooth by the special method. (*From Grant's Treatise on Gear Wheels.*)

illustrates a method of laying out an involute tooth by means of this odontograph table.

The pitch circle or pitch line should be drawn first and the addendum line drawn outside the pitch line at a distance from it equal to one divided by the diametral pitch or to 1-3 of the circular pitch. The dedendum line should be drawn inside the pitch circle the same distance, but in practice this is not used, the root line being inside of the pitch line by a distance equal to 9-8 of the addendum.

In January the author described the method of laying out gear teeth by means of accurate epicycloidal or involute curves. In the present article the more common method of obtaining them is shown. In the next issue the mechanical part will begin, showing apparatus for making the teeth, etc., after the laying out has been accomplished.—Editor.

The base line is drawn inside the pitch line by a distance of 1-60 of the pitch diameter. To draw a gear proceed as follows: The figure shows several teeth of a gear having 21 teeth 11.74 inches pitch diameter and 1¾ inches circular pitch. The gear is also shown in contact with the rack. After the various circles have been drawn the pitch circle should be spaced for the pitch points by stepping off with a pair of dividers or any other convenient method.

In the odontograph table opposite the 21 teeth and under the face radius is found the number 1.09. This must be multiplied by the circular pitch of the gear and gives 1.907. With the dividers set to this face radius of 1.907 draw the face of the teeth from the addendum to the pitch circle, keeping one point of the dividers on the base line as a center. If the number of teeth is greater than 36 or if the pitch is small, this face radius should be extended to the base line. In the case under consideration opposite 21 teeth in the table and in the column headed Flank Radius is found the figure .63 and this multiplied by the circular pitch gives 1.102. With the dividers set to this radius and the center on the base circle, draw the flanks of the teeth from the pitch circle to the base circle. From the base circle continue the flanks of the teeth to the root circle by straight radial lines and round the roots of the teeth with a fillet.

To lay off the rack teeth it is first necessary to draw a straight line for the pitch line and two parallel lines for the addendum and root lines. The sides of the teeth are drawn through the pitch points at an angle of 15 degrees from the perpendicular, as shown in Fig. 4.

The point of the tooth from the point A Fig. 4 to B must be rounded by an arc drawn from a center on the pitch line and with the dividers set to a radius equal to 2.10 inches divided by the diametral pitch or the circular pitch multiplied by .67. In the case under consideration multiplying .67 by the circular pitch we obtain 1.17 as the radius to be used.

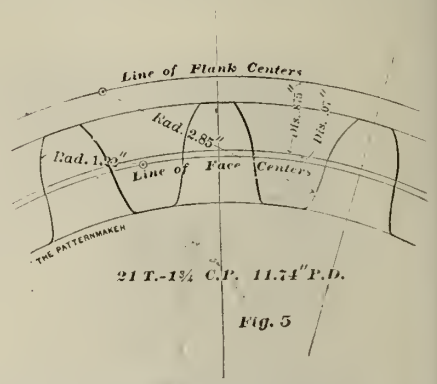


FIG. 5—LAYING OUT EPICYCLOIDAL TOOTH BY ODONTOGRAPH TABLE.

Epicycloidal Odontograph Tables

Grant has also gotten up an odontograph table giving the proportions of epicycloidal teeth. To apply this table in laying out the gear shown in Fig. 5 we will proceed as follows:

The gear has 21 teeth, 11.74 inches pitch diameter and 1¾ inches circular pitch. The pitch circle, addendum and root circles should be drawn. The pitch points should also be marked on the pitch circle.

In the odontograph table we find opposite 21 under the head of circular pitch

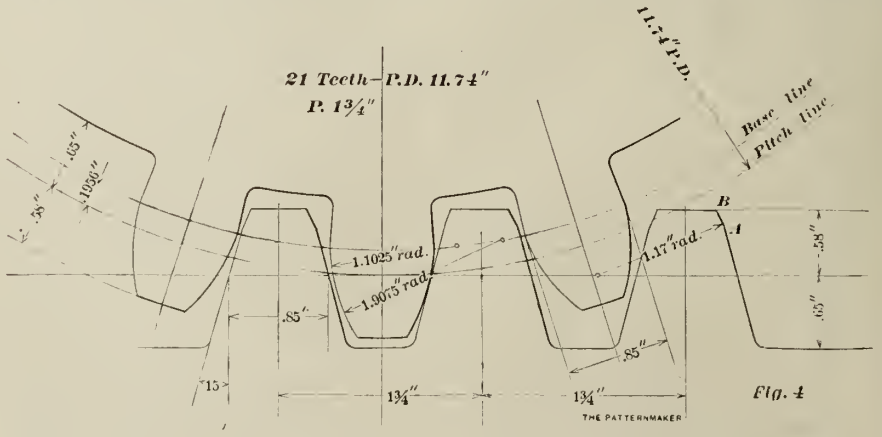
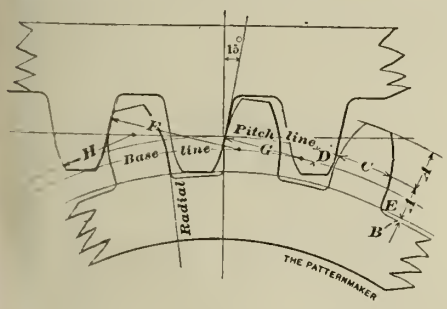


FIG. 4—LAYING OUT INVOLUTE TOOTH BY MEANS OF ODONTOGRAPH TABLE.

and the faces of the teeth, .04 as the factor for obtaining the distance of the circle of centers from the pitch circle. Multiplying the circular pitch by this we have .07 and hence we must lay off a circle at this distance inside the pitch circle.

The flank center distance for 21 teeth is .5 and multiplying this by the circular pitch we have .875 as the distance between the pitch circle and the line of centers for the flanks. This circle should be drawn as shown in Fig. 5. From the table we find that the factor for the face radius of the 21 teeth is .70, then multiplying the circular pitch by this factor we have 1.22. With the dividers set to this radius and keeping one point on the circle of face centers the faces of all the teeth should be drawn. From the table we find that the factor for the radius of the flanks of the teeth corresponding to 21 teeth is 1.63 and multiplying the circular pitch by this we have 2.85. With the dividers set to this radius and one point on the circle of flank centers, we should draw the flanks of the teeth. Small fillets should then be drawn at the base of each tooth, thus completing the tooth outline.



GRANT'S EPICYCLOIDAL ODONTOGRAPH

Standard Cycloidal Teeth—Interchangeable series

From a Pinion of Ten Teeth to a Rack

Number of Teeth in the Gear		For One Diametrical Pitch — For any other pitch divide by that Pitch				For One Inch Circular Pitch — For any other Pitch Multiply by that Pitch			
		Faces		Flanks		Faces		Flanks	
Exact	Intervals	Rad.	Dis.	Rad.	Dis.	Rad.	Dis.	Rad.	Dis.
10	10	1.99	.02	— 8.00	4.00	.62	.01	—2.55	1.27
11	11	2.00	.04	—11.05	6.50	.63	.01	—3.34	2.07
12	12	2.01	.06	∞	∞	.64	.02	∞	∞
13½	13—14	2.04	.07	14.50	9.43	.65	.02	4.60	3.00
15½	15—16	2.10	.09	7.86	3.46	.67	.03	2.50	1.10
17½	17—18	2.14	.11	6.13	2.20	.68	.04	1.95	.70
20	19—21	2.20	.13	5.12	1.57	.70	.04	1.63	.50
23	22—24	2.26	.15	4.50	1.13	.72	.05	1.43	.36
27	25—29	2.33	.16	4.10	.96	.74	.05	1.30	.29
33	30—36	2.40	.19	3.80	.72	.76	.06	1.20	.23
42	37—48	2.48	.22	3.52	.63	.79	.07	1.12	.20
58	49—72	2.60	.25	3.33	.54	.83	.08	1.06	.17
97	73—144	2.83	.28	3.14	.44	.90	.09	1.00	.14
290	145—300	2.92	.31	3.00	.38	.93	.10	.95	.12
∞	Rack	2.96	.34	2.96	.34	.94	.11	.94	.11

The table gives the distances and radii if the pitch is either exactly one diametral or one inch circular and for any other pitch multiply or divide as directed in the table.

(From Grant's Treatise on Gear Wheels.)

GRANT'S INVOLUTE GEAR TEETH PROPORTIONS

Circular Pitch.	A.	B.	C.	E.	H:
1	.33	.04	.49	.08	.67
1⅛	.37	.04	.55	.08	.75
1¼	.41	.05	.61	.10	.83
1⅜	.45	.05	.67	.10	91
1½	50	.06	.73	.12	1.00
1¾	.58	.07	.85	.14	1.17
2	66	.08	.98	.16	1.34
2¼	75	.09	1.10	.18	1.50
2½	.83	.10	1.22	.20	1.67
2¾	.91	.11	1.34	.22	1.84
3	1.00	.12	1.47	.24	2.01
3¼	1.08	.13	1.59	.26	2.17
3½	1.16	.14	1.71	.28	2.34
3¾	1.25	.15	1.83	.30	2.51
4	1.33	.16	1.96	.32	2.68
4¼	1.41	.17	2.08	.34	2.84
4½	1.50	.18	2.20	.36	3.01
4¾	1.58	.19	2.32	.38	3.18
5	1.66	.20	2.45	.40	3.35
5¼	1.75	.21	2.57	.42	3.51
5½	1.83	.22	2.69	.44	3.68
5¾	1.91	.23	2.81	.46	3.85
6	2.00	.25	2.94	.50	4.02
6½	2.16	.27	3.18	.54	4.35
7	2.33	.29	3.42	.58	4.69
7½	2.50	.31	3.67	.62	5.02
8	2.66	.33	3.92	.66	5.36
8½	2.83	.35	4.16	.70	5.69
9	3.00	.37	4.41	.74	6.03
9½	3.16	.39	4.65	.78	6.36
10	3.33	.41	4.90	.82	6.70

D or distance to the base line equals 1-60 of pitch diameter.

Proportions of Tooth Parts

Grant has gotten up a table of proportions of tooth parts for use in connection with his involute odontograph. For convenience, however, in obtaining this information quickly for different pitches, a diagram like that shown in Fig. 6 may be used. This diagram is for the extra short involute tooth and gives proportions of teeth from ¼ inch to 6 inches circular pitch. Such a diagram can be made for teeth of any proportions, and will be found a great time saver on account of the fact that its use reduces the calculations necessary.

In laying out such a table A-B represents the greatest pitch required, in this case six inches. The perpendicular B-C is used for laying off the various proportions for six inch circular pitch. After these points are laid off they are connected with the point A by a series of diagonal lines. In order to obtain the proportions for any other tooth it is only necessary to erect a perpendicular at a distance from A corresponding to the circular pitch desired. In the illustration perpendiculars have been drawn corresponding to all circular pitches between ¼ inch and 6 inches, varying by quarters of an inch. The proportions of this short involute tooth are as follows: Addendum equals 2-10 circular pitch. Dedendum equals 5-100 circular pitch, plus .01 of an inch. The thickness of the tooth equals 47-100 of the circular pitch.

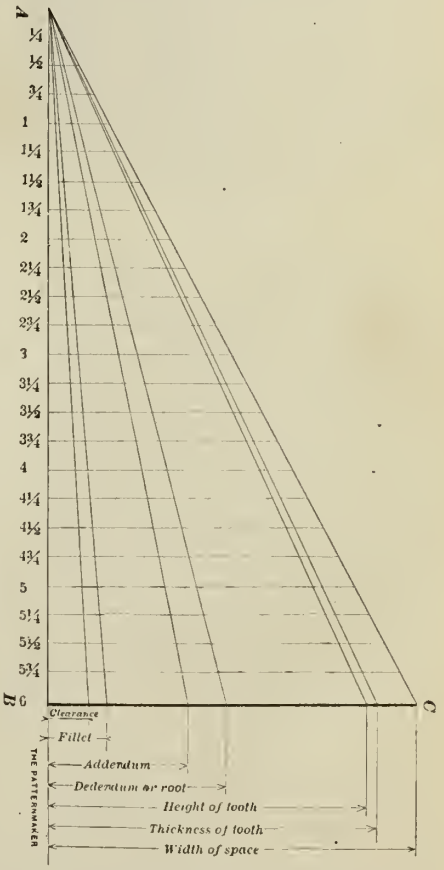


FIG. 6—TABLE OF PROPORTION FOR USE IN CONNECTION WITH INVOLUTE ODONTOGRAPH.

Students' Course in Foundry Practice—Sand

Sharp Sand, Round Sand, Moulding Sand, Core Sand, Heavy Sand, With Spaces Filled With Moulding Sand—How Ramming Affects the Vent of the Sand.

By F. H. BELL

As mentioned in our last lesson, sharp sand is the most desirable as a base for green molding sand, while sand with a grain as near round as possible is to be preferred for core sand. In Figure 1 will be seen sample grains of a good sharp sand. If a good average grade of molding sand is washed it will be found to contain about 85 per cent. of grains similar to these, and about 10 per cent. clay. The balance will be made up of iron oxide, lime, magnesia, soda, potash, alkali, etc. The quality and quantity of the foreign matter which is associated with the sand and clay go a long way in determining the grade of the molding sand. If much lime and iron is present it tends to flux the sand and create a slag which adheres to the casting and in fact actually mixes with the melted iron and

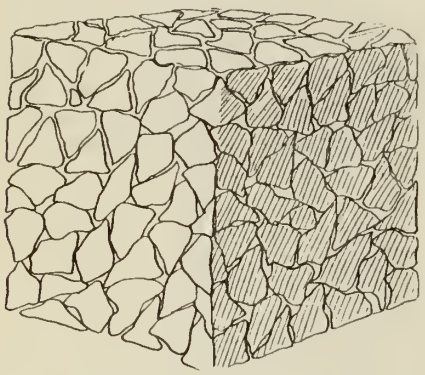


FIG. 1—SAMPLE GRAINS OF GOOD SHARP SAND.

forms part of the face of the casting. If pure silica and pure alumina are mixed in proper proportions they make a molding sand which will peel from the casting, leaving a clean metal surface, but not having a fluxing material it bakes into a solid mass like pottery and has to be sifted out before the sand heap can be cut up for use again. It will therefore be seen that while the foreign material has its undesirable features, it also has its desirable ones, and that a sand suitable for the work being done must have the right proportion of each ingredient. To give a definite explanation of the proportions required it would be necessary to go into chemistry, which might be unintelligible to a good many foundrymen, but without going deep into the subject I would refer to the melting of metal in a brass foundry.

Everyone who has had experience in this line knows that metals which are hard to melt are easily melted when mixed together. So it is with the sand mixtures. Silica, which is practically proof against heat, will, in the presence of the lime and other foreign matter form silicates which melt at a low temperature. Silicate of soda will melt at a temperature of 1,500 degrees Fah., while melted iron will be at a temperature around 2,300 degrees Fah., so it be easily seen what will happen when a mold containing silicate of soda is subjected to a heat of 2,300 degrees Fah.

Good molding sand will carry as high as 5 per cent. of iron and about half that amount of lime and magnesia, but not more than three-quarters of 1 per cent. of alkali. If the sand is of this analysis and of fairly even sized grain it should produce good, clean-skinned, gray iron castings.

Now to get back to the grains of sand shown in Fig. 1. Good clean silica sand with a grain similar in shape to this will make good castings with the clay content as low as 5 per cent. and with heavy sand the clay may be even less than this amount. While the size of the grain is not the only point of interest it is advisable to have heavy grained sand for heavy castings and lighter sand for for lighter castings, but as pointed out in our last lesson, I have seen light sand peel clean from heavy castings, and heavy sand burn into the metal on similar castings in the same shop.

Ramming

In green sand molding the ramming is of much more consideration than in dry sand work. If, as we have said, we can locate a sand with proper grain we will require a very small amount of clay, and as it is the clay which bakes and makes the trouble, a much smaller amount of fluxing material will be required, and herein lies the secret of first class molding sand for doing gray iron work in green sand molds. If the sand is rough enough to almost hold together without bond, there is no occasion to have anything but pure silica and alumina (sand and clay), providing that such a deposit can be located. In ramming the sand into the mold the rammer forces the lumps on one grain to pass those on the next grain, while continued ramming forces the lumps on the one to fit in the spaces on the other sufficient to hold them together with the aid of the bond. If rammed too hard the grains will fit so close together as to prevent egress of the steam and gas. If the clay content is any way high and hard ramming is indulged in the grains will be forced as close together as their roughness will permit and the excess of clay will fill any possible space which was left, thereby closing up every avenue of escape for the gas which inevitably will be generated and which must escape. There being no other escape for the gas the mold is forced to scab or possibly blow up. If the sand is low in alumina (clay) there is very little trouble even from excessive ramming. From this it will be seen that for heavy castings where the mold must be rammed hard in order to resist the pressure of metal it is essential that a sand low in clay be used. Hard ramming is blamed for most of the ills in the foundry when in reality it is responsible for very few of them. All that is required in ramming a mold is to not have the grains of sand so close together as to prevent the escape of the gas. If the sand is such as we have just pictured as being

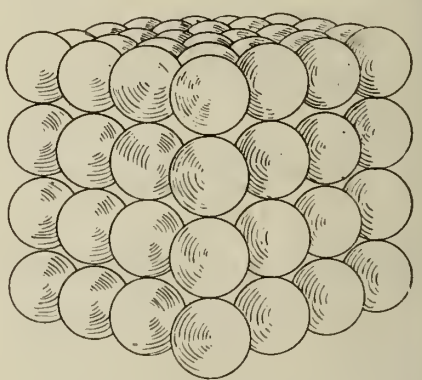


FIG. 2—HOW A PERFECTLY IDEAL ROUND GRAIN WOULD APPEAR.

the best and is not rammed fairly hard it will not only allow the casting to strain but will wash from the flow of the iron and will be even more apt to scab than if rammed hard. Sharp sand with a high percentage of clay should not be used on heavy work because it will not stand to be rammed hard and consequently will not stand the strain.

Venting

Venting the mold is an important feature and required to be done in a proper manner. If the pattern which is being molded is of complicated design and has difficult pockets to get the gas off of, they should be tucked carefully and vented with a needle wire. The sand in the vicinity of the pattern should be planed lightly so as not to close the grain too much, but the sand which is used to fill up the balance of the flask can be rammed as hard as a stone for that matter and do no harm, as it can be vented with a large wire. The sand being open near the pattern allows the

vent to penetrate it regardless of the vent holes when the sand at a distance from the pattern becomes too hard for rest of the way. By this means the casting is prevented from scabbing, and by having hard sand back of what faces the pattern the casting is prevented from straining. I know this is the reverse to what the average molder will argue. His rule would be to pean the surface until he is sure it will scab and just pat the back down with the butt of the rammer so as to be sure it will strain. To demonstrate whether I am right or wrong do not experiment with expensive work but just put down a flat board and a deep drag. Fill the drag with sand and do not pean it, but butt it as hard as you like, and then roll it over and see what the face will be like. It will be soft.

Round Sand

In Fig. 2 will be seen an ideal round grained sand. Of course it is more ideal than is possible to secure, but for dry sand and core work a sand with the grains as near round and as near uniform in size as possible is the best. One feature which will commend itself is the fact that no matter how hard it is rammed the grains cannot be forced any closer together and consequently the openings between them cannot be closed. In our next lesson we will feature core making and dry sand molding.

WANTS METALLURGICAL AND MELTING INFORMATION

Editor Canadian Foundryman: Being a reader of your journal, which is full of valuable information of all kinds, I would like to ask you a few questions. What is the reason that there is no hot air used for cupola blast, as is done on blast furnaces (smelters) and why do certain smelters use cooled air?

Would it make any improvement in the iron, speed in melting, and saving in coke to use hot blast in the cupola?

What is the average working of a 24-in., 30-in., 36-in., 42-in. cupola in iron and coke in the first hour?

Answer.—According to those who have made a careful study of the subject and who have done considerable experimenting the results achieved would not merit the expenditure. It must be remembered that a blast furnace runs continuously and that in blowing in a newly fitted furnace it takes some time before the furnace gets working at its best and before the hot blast has much effect. With an ordinary foundry cupola the heat would be over long before the hot blast would become effective. Many experiments have been tried and much money expended in designing hot blast cupolas, but none of them have proved sufficiently successful to encourage cupola manufacturers to try to put them on the market. The one which we illustrated some months ago with the wind jacket around the melting zone would undoubtedly have all the good qualities which could be secured without a big outlay for recovering the blaze from the stack and utilizing it for heating the air as is done at the blast furnaces, and even then there is so little blaze escapes from a cupola until after the last charge has been put on, that there would not be much benefit derived from it. There is no doubt but that the quality of the metal would be improved, and that a percentage of the coke would be saved.

If foundry business ever gets so perfected that the cupola is kept in continuous operation there is a possibility that that hot blast cupola will gain in popularity.

Regarding cooled air in connection with blast furnace, you are probably referring to freezing the air. This is not done with a view to making the air cold, but for the purpose of making it dry. Ordinary air always carries a certain amount of moisture unless the temperature is below the freezing point. If this is forced through the heating stoves into the furnace it carries this dampness in the form of steam, which is objectionable. By first passing it through the ammonia refrigerator the moisture is frozen out of it and dry air is forced into the stoves and on through to the furnace.

Answering your question about the capacity of different sized cupolas, would say that the first hour of a heat has to include the bed charge of coke. In fact, the first half an hour would, if that was the duration of the heat. The coke bed is an unavoidable waste. acting the part of foundation for succeeding charges, and remaining after the heat is over. In addition to this we must allow about ten minutes for the furnace to get working properly after putting on the blast after which it is possible to estimate the capacity of the furnace for the remainder of the heat.

The rate of melting varies considerably, due partly to differences in tuyere area, and blast pressure, also to nature of materials of charge, whether dense or open, also upon coke melting ratio. Melting with a coke ratio of 8 to 1 will be faster and the resultant metal better than a ratio 10 to 1, but 10 to 1 is considered good practice when everything is working right. Assuming that everything is in good condition a safe rule is to calculate 2½ pounds of coke per minute per square foot of cross sectional area. Area of cross section multiplied by two and one-half, and the result multiplied by sixty (minutes) gives an ideal coke consumption per hour, and melting ten times this weight of iron. Thus a 2-foot cupola would have an area of 2 x 2 x .7854 = 3.1416 feet, which multiplied by 2½ gives us 7.85 pounds of coke burned per minute or 471 pounds per hour, while melting 4,710 pounds of iron. Working on this same principle a 2½-foot cupola would burn 735 pounds per hour, a 3-foot cupola 1,060 pounds and a 3½-foot cupola 1,448 pounds. Multiply by ten and get the amount of iron melted per hour.

WHICH IS CORRECT?

Editor Canadian Foundryman: The writer has often wondered why the Canadian press, generally speaking, persist in calling a foundry "a molding shop." This also reminds me that the Canadian Foundryman calls a tumbling mill a "rumbler." Which is correct?

Answer. — The expression "molding shop" would never be necessary were it not for the fact that not 1 per cent. of the population seems to know what a foundry is. Practically everybody looks upon an iron working industry of any kind as a foundry, and then to make it known which department they are alluding to they speak of the molding shop, machine shop, pattern shop, etc. This, of course, is improper and should be rectified. In this connection I would say that the main plank in the platform of the Canadian Foundryman is to elevate the foundry from the disreputable position with which it has always appeared to be satisfied, and instead of being a squatty building, erected in the back yard behind a three or four-story machine, have it come out and hold its own among other industries. It should invariably be known as the foundry, and no other part of the plant should be allowed to use this name.

In regard to the "rumbler," it has too many names, but I am not prepared to pose as an authority on which is correct, although I prefer "rumbler" for the reason that this word has no other meaning. Tumbling mill, tumbling barrel, rattle barrel, tumbler, rattler, fettler and innumerable other names seem to be applied to this instrument, but none of them has any advantage over "rumbler." But here is another demonstration of foundry laxity. The foundrymen should adopt a name and insist on its use.

PIG IRON PRODUCTION

The Mines Branch estimates the output of pig iron in Canada during the current year at 1,000,000 short tons, as compared with 917,781 in 1919 and 1,195,551 in 1918. The statistics of pig iron production in Canada disclose no enlargement of blast furnace capacity during the past ten years. The increase in the production of steel ingots and castings during the war was obtained by using up old stock, scrap and shell turnings and by the employment of electric furnaces; but so far as regards blast furnaces, the Dominion is no better off now than she was ten years ago.

Mr. L. H. Pickles of T. H. Pickles & Sons, Empress Foundry, Mytholmroyd, Yorkshire, Eng., writes: "We read the Canadian Foundryman with interest and think very highly of it. It contains many valuable items and we look forward to receiving it month by month."

B. G. NEWTON, Manager
A. R. KENNEDY Managing Editor
F. H. BELL, Editor

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal Devoted to the Foundry and Metal Industries

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Conditions Are Improving

OPTIMISM is a nice state to dwell in and it sometimes transpires that an optimistic attitude has a lot to do with encouraging others, with the result that a general improvement takes place. Pessimism is possibly the worst characteristic which a person can possess, but between the two extremes there is a state which we might term "the honest truth." This is really the proper state to aim at. When we know a thing is no good there is no use in straining the imagination and trying to make ourselves think it is all right. When we do not know whether it is all right or not we should not look at once for the dark and gloomy side and prepare to receive it. Neither of these extremes brings us much. What we want is the honest truth and if we cannot get it we can do the next best and hope that things will turn out all right. Optimism will bring more in its wake than pessimism will, but as we have shown, there is no use in being too optimistic when there is nothing back of it.

A newspaper publishing a glowing account of the good times which do not exist is contemptible. But to get back to the honest truth there has not been any great amount of unemployment outside of the big cities where idlers usually accumulate. Most of the manufacturers were prepared to keep on their full staff with reduced hours, but some organizations refused to accept these terms, preferring to see some of their number dismissed. Quite a number of concerns closed down for Christmas and remained closed during the month of January, starting with full force on the first of February. Other concerns with empty storehouses remained closed until arrangements could be made with the men to accept a different schedule of wages. Others put up a notice that beginning with a certain date the wages would be reduced.

All told, readjustment is the cause of all the unrest and unemployment. Prospective buyers do not want to buy if the price is coming down and manufacturers do not want to stock up if the price is going to be lower. Working men do not want to work for less money unless living expenses are reduced.

The price of clothing has been reduced to some extent, but the price of provisions is holding its own nobly.

In a pinch we can do without new clothes, but we must have food. Everything considered, there is a sort of mix-up where everyone is hesitating to some extent, but every day of hesitation makes for that much busier times when things do get stabilized. A visit to the industrial centres of the province during January revealed more men employed than in December, which, coupled with the fact that several shops would open up with full force in February, certainly portends livelier times ahead.

The Other Side of the Question

In connection with the unrest and unemployment question there is the manufacturers' side which prudence dictates he must keep to himself. The foundryman, for instance, sees that there is work to be done, but the customer will not say the word; rather than close down the foundryman makes a tempting offer in the way of price. This is exactly what the customer has been waiting for and he yields with the result that the foundryman has to get it out of the men. He dare not tell them his business, because he wants to keep it quiet, so he has to argue that he has been losing money all the time.

However, little by little the wages are being cut and the prices are being cut, which makes for normal times, and if the cut ever gets around so as to affect the house rent and dinner table problem, everyone will be as well off as before.

Pig Iron Prices Are Lower

PIG iron is now being quoted at $39.25 in Toronto—that is for No. 1 foundry. The last price was $43.65 and the price above that was over the $50 mark.

Working as they are from old materials the chances are that the makers of pig iron in Canada are not making money out of the new price. They are using ore that came down last season and the same can be said of their coal and coke. Were they able to take advantage of present-day prices they would be able to go ahead on a much more satisfactory basis. For instance, the present price of Connellsville coke is around $5.50, while it is certain that Canadian stocks are melting with coke that has cost them well above that figure.

Pig iron is being sold on a smaller basis than usual. Firms are buying in 50-ton or car lots and are not stocking for future usage.

The Peacock's Cry

THE MAN who predicted that times would be busy after New Year's is likened unto the man who said that it always rains after the Peacock cries; he did not say how long after.

Scraps *from* The Foundry Scrap Pile

New Brass Foundry for Quebec.—The contract has been let for the construction of a brass foundry at the corner of Des Prairies and Valier Streets, Quebec, for the Quebec Brass Foundry Company.

New Foundry for Ottawa. — Beach Foundry Co. are making preparations for the erection of a new foundry and are asking for tenders on the same. Construction will begin as soon as the contract is let.

The International Malleable Iron Co., Guelph, Ont., who have recently completed large extensions to their plant, contemplate further extensions and with this in view have purchased twelve acres of land adjacent to their plant and will begin operations on the extensions in the early summer.

The Canada Iron Foundries, St. Thomas, Ont., whose buildings were damaged by fire last summer, have built bigger and better than ever. During the last year the company has expended over $150,000 on new buildings and as soon as the winter is over will proceed with further extensions.

Another Industry at Windsor.—The E. S. Bryant Pattern Works, Ltd., Windsor, Ont., has been incorporated with a capital of $40,000 to do pattern making and also to do a general foundry and machine shop business. The principal men in the organization are: E. S. Bryant and Edward J. Mamer, of Detroit, and Frederick G. Loeffler, of Windsor.

New Foundry for Chatham.—A foundry for the manufacture of stoves, furnaces, and other heating devices is to be established in Chatham, Ont., by E. M. Reeve, B. L. Bedford, Charles J. Cummings and others. The new industry will be known as the Mask Furnace Co., Ltd., and will be capitalized at $25,000. It is the intention of the company to have the plant in operation in the early summer.

Toronto Foundry Company, 1884 Davenport Road, Toronto, have taken over the business formerly operated under the name of the Pioneer foundry and doubled its capacity by enlarging the foundry building to double its former size, making twenty floors in all. The equipment is all being remodeled and put into shape to meet the new requirements. Mr. Arthur Mason, a practical foundryman, is the manager and he reports a good volume of business coming along.

The Panghorn Corporation, Hagerstown, Maryland, have issued a catalogue describing their sand dryer, moisture and oil separator and other sand blast equipment. The catalogue also contains an open letter on sand blast management, showing how to decide what machine to use for the class of work in hand.

Machinery and Foundries, Ltd., have started operations in their new foundry at Brockville, Ont. The first heat was taken off in the foundry on Monday, Feb. 7, and it was a decided success. The company will manufacture pumps and hardware specialties. Mr. George E. Purkis is the general superintendent of the company.

The John Inglis Co., Ltd., Toronto, are preparing to erect a new foundry at a cost of approximately $250,000 during the coming summer. This company manufacture and build some of the largest machinery which is turned out in Canada, and have during the last few years replaced their machine shop and boiler shop by large and up-to-date buildings fully equipped with the best of everything in the way of equipment. Large waterworks pumps and triple-expansion marine engines are among their specialties. Their present foundry has long been inadequate for this class of work with the result that they have been producing their own small castings and buying their large ones. The new foundry will be equipped with powerful electric cranes, large cupolas and ovens, and everything about the plant will be of such dimensions as will be required for the class of work being done.

The Brantford Computing Scale Co. is building a new foundry to supply their own plant with castings. The company manufacture a full line of computing scales, in addition to cheese cutters and specialties of like order, and so far have purchased their castings from outside foundries. The business, which was established in a small way some fifteen years ago, has been steadily gaining ground until now when it is considered of sufficient magnitude to warrant the expenditure contemplated in the construction of a complete new foundry. The class of work is such that castings other than the finest and smoothest cannot be used, which in itself is sufficient guarantee that nothing but the best of equipment will be installed.

Windsor Foundry Organizing. — The Mitchell Brass Foundry Co. is being organized to do a foundry business in Windsor, specializing on oil-burning brass furnaces. Mr. Mitchell has been in business for some time and has installed some of the furnaces in Canadian plants with gratifying results. When properly organized a suitable plant will be erected and the furnace business pushed to the limit.

CATALOGUES

The Buckeye Products Co., manufacturers of foundry facings, supplies and equipment, 919-929 West Fifth Street, Cincinnati, Ohio, are sending out their general catalogue No. 7, containing 399 pages of matter descriptive of the goods manufactured and handled by the company, which includes everything which is used in the foundry.

Together with this are numerous tables giving sizes and capacities of blowers, cupolas and ladles, information regarding crucibles and a general line of instruction in foundry work. The book is well bound in cloth and would be a valuable addition to the foundry library.

Solving the Housing Problem is the title of a pamphlet being circulated by the Portland Cement Association, 111 West Washington Street, Chicago. One of the leading features in the book is an article on how the Ingersoll-Rand Company is solving its housing problem with concrete. The story is interesting and if reproduced would be a valuable guide for manufacturers who would provide homes or encourage the building of homes for their employees. As the book is free for the asking we will not go into details of its contents. The cross section views of reinforced concrete work, demonstrating how the cement work appears from the bottom of the front step to the top of the roof, are particularly interesting.

The C. O. Bartlett & Snow Co., Cleveland, Ohio, are distributing their catalogue entitled "Ideas" for the man who wants to make his foundry more profitable, more productive and more human.

The line manufactured by this company and illustrated in the catalogue consists of sand handling and conveying machinery, including belt conveyors for distributing tempered sand, underground conveyor for carrying knock-out sand, centrifugal discharge bucket elevator, sand screening and mixing machine for use under foundry floor, conveyors for carrying castings, for delivering pound molds to the knock-out grate, for conveying new molds to the pouring floor, in conveying and handling equipment of every kind together with descriptive matter and views of foundries with the equipment installed.

The United States Smelting Furnace Company, Belleville, Illinois, have just issued an interesting catalogue, which coupled with the photographs which accompany it make valuable reading along a line which is not usually so well covered. The company, as the name implies, manufacture smelting furnaces of the rotary type. Among the illustrations are shown views with descriptive matter of enamel furnaces for preparing the material for doing enamelling work. This in itself is interesting. The regular line, in addition to this, includes rotating furnace with capacities of 200, 400, 1,000 and 2,000 pounds capacity. A chart or plan of the installation of the furnace is shown in detail as it would stand in the foundry. All the details are described, also oil consumption, floor space, etc.

The Whiting Corporation, Harvey, Ill., have just received from the press and are delivering to the foundry public their Ladle Catalogue No. 156, illustrated and descriptive of their entire line of ladles which includes their new style helical worm geared crane ladle and a new style tea pot spout ladle having the spout inside of the bowl. Other units are tea pot spout ladle with outside spout, reservoir ladle, geared bottom-tap crane ladle, plain bottom-tap crane ladle, bottom-tap steel ladle with detachable bail, car-wheel ladles, ladle truck with mounted ladle, slag truck ladle, crane truck ladle, worm geared and spur geared ladles with various types of bail and ranging from small ladles up to almost any capacity. Much valuable information on the subject of ladles is included.

The Gardner Governor Co., Quincy, Ill., manufacturers of pumps, governors and compressors, are sending a number of interesting catalogues descriptive of their lines of goods. A full line of steam and belt-driven pumps is shown, as is also a profusely illustrated description of their governors. Their bulletin No. HAC-24 and their Gardner-Rix pamphlet are particularly interesting to foundrymen. These books show the details of their air compressors with full information and illustrations of the working of the pneumatic machines. The entire list of catalogues is interesting from an engineering standpoint, and since the compressed air driven equipment is taking such a leading part in foundry practice this department will be found most interesting.

BIG ALTERATIONS AT BRANTFORD FOUNDRY

The Buck Stove Works at Brantford, which was badly damaged by fire which took place in the third story of the mounting building, was later taken over by the McClary Mfg. Co., of London, Ont. It has been repaired where damaged by the fire and is, in addition, undergoing other extensive alterations. The foundry building was built about fifteen years ago, and had 132 molding floors. It was considered one of the best on the continent. In many respects it was, but it had its faults.

With a view to economy in fuel, and to some extent to the comfort of the men, it was built so as to be nice and warm. Nobody needed to suffer from the cold at any time of the year, but no thought was given to ventilation or comfort of the men in the summer time, and as a result the atmosphere of the foundry was intolerable during the hot weather. This meant dissatisfied men, and very few heats of 132 floors were taken off during the summer months. All this is being changed now. Windows and doors are being put in the blank walls, ventilators are being arranged and everything which tends to make for the comfort of the men is being provided. Lockers are being placed on every floor; an inside entrance to the cupola staging is being provided, the gangway, which is of iron plates, is being put in perfect order and all damaged plates replaced with new ones. The entire foundry floor, which was of clay, and which was considered to be a fairly good floor, was not good enough and is being replaced by concrete. The water barrels which were sunk in the floor at intervals have all been discarded and replaced by concrete tanks about a foot wide, two feet deep and three feet long. These tanks have overflow pipes a short distance from the top and connected with the underground drain, so that in case of a careless workman leaving the tap open, it would be impossible to flood the floor. All told, the molding department will be second to nothing in existence when the alterations are completed, which will be during the present month.

Another innovation, which is entirely for the benefit of the hands, is a commissariat department in charge of first-class chefs and waiters, where the men can secure a good meal or any part of a meal at cost. If a workman carries his lunch he can go to the counter and get a pot of hot tea or coffee and whatever dishes he requires. If he wants a full course meal, this is also provided.

This plan has been in vogue for some years at the works in London and has given entire satisfaction.

The system of punching in for work has been changed so that each department has its own clock and the men do not have to make a long, out-of-the-way trip to the clock.

Every department of the plant has been rearranged to suit modern conditions. Most of the departments have been extended and several new buildings have been erected. When completed the plant will be up to date in every particular and will employ many additional hands. Robert C. Middlemis, who was for many years in charge of the foundry under the Buck ownership, has been retained, and is personally supervising the alterations in his department.

MEN OPPOSE WAGE CUT

Fort William, Ont., Feb. 2.—Seventy per cent. of the staff of the local plant of Canada Car and Foundry Co., numbering twelve hundred, quit work today when the company posted notices of a ten per cent. reduction in pay of piece workers.

"FOUNDRYMAN" NOT "FOUNDRY"

A foundry foreman who got an idea from an article which he read in Canadian Foundryman and who wished to show us his appreciation and to compliment us on our editorial efforts wrote us a real nice, complimentary letter which began like this: "I read with much interest your article which appeared in this month's Foundry." Now we appreciated that letter and the spirit in which it was written and inasmuch as we were the recipients of it, it accomplished its purpose, but look at the harm it might have done if it had been sent elsewhere. With due respect for our esteemed antagonist "The Foundry" and wishing it all the credit which is coming its way, we do wish that our readers would always be particular to let us have what is coming our way and say they saw it in Canadian Foundryman.

CARE OF LADLES

Ladles should be thoroughly gone over every day, as should all machinery, to see that keys are in proper place and tightened into shafting. All bearings and gears should be properly oiled so that hand wheel will turn easily. Any iron which has lodged in the gear teeth should be carefully removed and thus prevent binding.

Good fire-proof material is to be recommended for lining, both for iron and steel, although fire brick is safest in the larger sizes. Never use a sledge to remove old lining from a geared ladle as this distorts the bowl and causes the gears to bind. The ladles are equally as important as any of the other equipment and should be as well cared for.

Low Priced Facings of Guaranteed Quality

All Hamilton Foundry Facings are of the highest quality and every barrel is guaranteed to give uniform, dependable service. Our **direct from manufacturer to consumer policy** enables us to offer our facings at prices which mean **practical economy** for every user.

And remember that the use of Hamilton Facings will save the customs troubles which come hand in hand with imported goods.

Write for Samples and Prices

-:-

Immediate Deliveries

CLIMAX GREY CORE COMPOUND

The use of Climax Grey Core Compound assures you cores which are always clean and hard. The cores dry quickly and do not become damp in storage or in the mold, neither do they sag, scab nor buckle. A few cents' worth of Climax Grey Core Compound will save dollars' worth of labor. Give it a trial.

CLIMAX CORE WASH

Climax Core Wash remains in suspension, will not wash, buckle, or rub off, and it cleans easily. The materials of which it is made are selected for their heat-resisting qualities. A trial will convince you.

The Hamilton Facing Mill Co., Limited

Head Office and Mills

Hamilton, Ontario, Canada

The Use of the Pyrometer in Steel Industry

A Continuation of a Paper Discussing the Progress Made in the Accurate Measurement and Control of High Temperatures in the Heat Treatment of Steel of All Kinds

Continued from page 42 of Dec. issue.

THE white light burns when the temperature is correct. If the temperature drops below, the green light glows, or if it rises above the desired temperature the red light burns. The operator of the furnace does not have to know how to read a temperature scale; all he need be instructed is to keep the white light burning and what he is to do when the red or green light burns.

Incorporated with this system is usually a signaling system to indicate when the steel is to be removed from the furnace, where a definite time interval for heat-treatment has been determined.

A step farther is the automatic signaling of the temperature by an automatic signaling pyrometer which can be incorporated in the standard form of millivoltmeter pyrometer. Instead of the pointer being depressed on a record chart as in the recording instrument, it may be depressed on to contact plates representing the correct temperature, too high or too low. By incorporating with such an instrument a switching mechanism, a number of thermo-couples can be connected to a single indicating instrument and as many as twelve or more thermo-couples can be connected to one signaling pyrometer, which will automatically operate the lights at the furnace, eliminating the operator who is now required to flash the lights from the central station.

Automatic Temperature Control Pyrometers

The day when the furnace temperatures will be accurately controlled automatically is coming very rapidly and notable progress has been made in this respect during the last few years.

The application of automatic control pyrometers to electric furnaces is a comparatively easy problem, as automatic switches can be easily operated by a solenoid which can in turn be operated by the same contact device in the pyrometer as used in the signaling instrument. We have applied automatic temperature control to electric furnaces most successfully, and some 100 electric furnaces to my knowledge are being controlled automatically at present.

This control may be secured by the opening and closing of the main circuit or line, or by cutting in and out a small portion of the available current, which is possible through cutting and out of rheostats. In this way the fluctuation in current is materially reduced as compared with opening and closing the main circuit.

Automatic control of gas-fired furnaces is a little more difficult, as a gas valve to be tight and not leak under continual operation must be well packed and considerable power is required to operate the valve. We have, however, by the use of powerful solenoids, or by motor-operated valves, been able to overcome this, and we have a number of gas-fired furnaces of large dimensions which are automatically controlled.

There is no question in my mind but that within the next year or two the automatic control of furnace temperatures will be very generally adopted wherever a constant temperature is to be maintained and it is desirable to eliminate the human element and hand control.

I have developed a special type of automatic control pyrometer which can be connected to almost any number of furnaces. It was necessary to add the required switching mechanism to connect the various thermo-couples to the instrument and also connect simultaneously the various electrically-operated valves or switches.

Another step and we have already developed an instrument of this character, for which patents have been applied for, is an instrument in which the contact table carrying the high and low contacts is moved along the temperature scale by clock mechanism at any desired rate of speed so that where a furnace must heat up at any given rate, this can be accomplished automatically.

Assuming, for example, that a large annealing furnace should have to attain a temperature of 1600° Fahr. in twenty-four hours. The clock mechanism advances the contact table across the scale to 1600° Fahr. in the period of twenty-four hours, and when this temperature is attained the current can be automatically shut off if desired, opening the switches to an electric furnace or closing the valves if a gas furnace is used.

The problem which has offered a little difficulty, but which we seem to be rapidly solving, is the automatic control of oil-fired furnaces, as the oil burners usually operate under high pressure and the burner may become clogged, which will be noticed if an operator is available, but offers difficulty with automatic temperature control. I feel that we are rapidly reaching a point when this difficulty will be solved by securing an automatically-operated burner which is foolproof and will not clog.

Pyrometers in Steel Treatment

I think many are not aware of the part pyrometers play in steel treatment from the smelting of the iron until the finished product. Let us take a part made from high-grade alloy steel. First in the blast furnace where the iron is smelted; the hot blast temperatures and the temperature of the escaping gas from the furnace are accurately controlled by thermo-electric pyrometers.

Next, the open hearth furnace where the steel is refined. Temperatures are very largely controlled in these furnaces by installing a platinum thermo-couple in the slag pocket or the gases from the checker brick. A very satisfactory record can be secured on a recording pyrometer of the working of the open hearth furnaces in this indirect manner. Optical pyrometers are also used to focus on the molten steel in the furnace or on the steel in pouring.

The forging of steel carried on in forging furnaces at a temperature of around 2000° Fahr. is accurately controlled with the aid of thermo-electric pyrometers, using platinum thermo-couples with special Durax tubes.

The annealing, hardening, re-heating and the quenching temperatures are realized by everyone to be of the utmost importance and should be accurately controlled with pyrometers. Where oil or water is used for quenching, recording thermometers or resistance thermometers are applied to advantage.

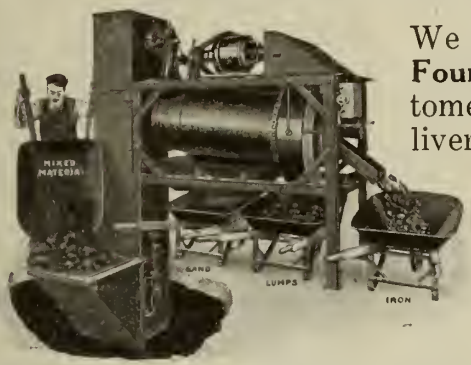
This will give some idea of the part pyrometers play from iron in pig form to the finished steel part, the recent improvements in pyrometry, and the outlook for the next few years. I want to make one point clear, however, that while we are continually striving to improve the pyrometers which we manufacture and design these instruments to better meet each requirement, our efforts are a failure provided we cannot educate the users of pyrometers in how to use and care for them.

If you instal pyrometers, take the time to make a little study of how the instruments operate, how they can be best installed, and how they are to be cared for after they are in use in your plant. If you have quite a number of furnaces and a considerable pyrometer installation, place a man in charge of the instruments who has been first instructed in the information anyone should have to handle such a job. Do not take an office boy to look after your pyrometer equipment as I have seen so often done. A first-class pyrometer equipment will pay for itself time after time during the year, and will be of infinite benefit to the user provided, first, it is properly designed to meet the conditions; second, it is properly installed; third, it is properly understood and cared for.

We are struggling every day to make pyrometers better. Can we not count on the users of pyrometers to endeavor every day to make the care of the pyrometers better? If this can be accomplished, then the troubles with pyrometers will very rapidly disappear.

What does "Service" Mean to You?

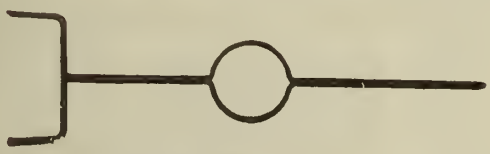
We can supply you with the highest quality Foundry Supplies for every purpose



Magnetic Separator

We have **"Everything for the Foundry"** and can give our customers the benefit of prompt deliveries. We handle the Whiting line, which includes all equipment for making Brass, Steel, or Iron Castings.

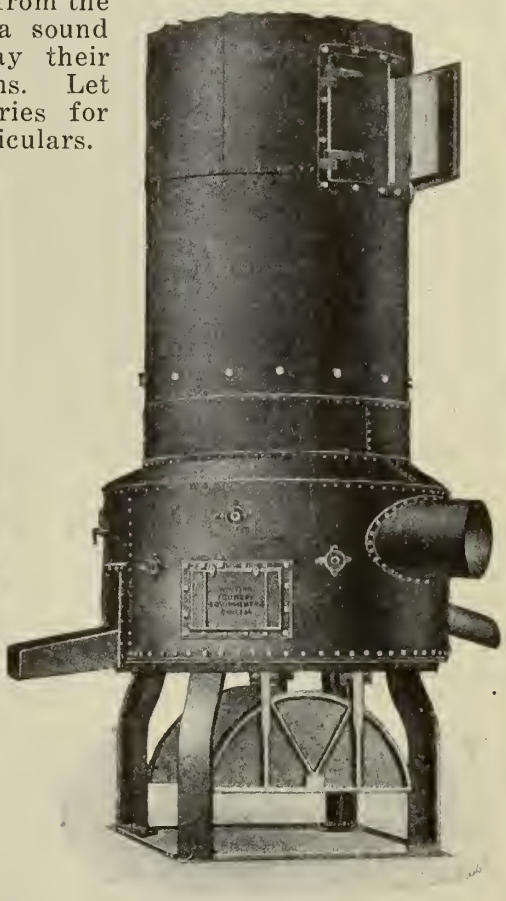
We also handle **Magnetic Separators** for reclaiming iron and steel parts from the refuse. They are a sound investment and pay their cost in a few months. Let us have your inquiries for prices and full particulars.



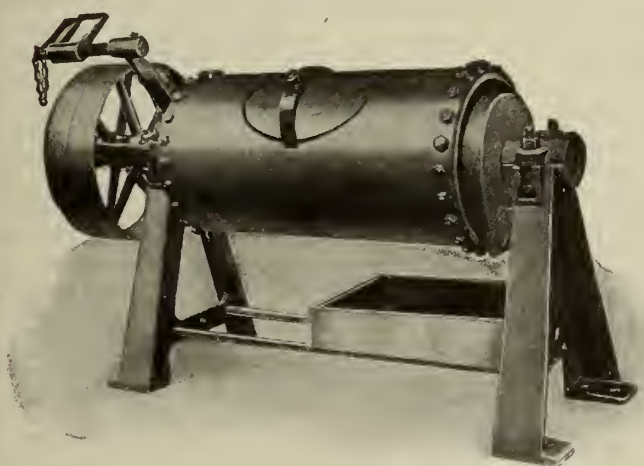
Crucible Shanks of All Sizes

We Handle "Branford Vibrators" and Accessories

Crucible Tongs of all sizes.



Cupolas and Accessories



Tumblers for Wet or Dry Milling. Two Sizes

The Dominion Foundry Supply Co., Limited

Everything for the Foundry

MONTREAL TORONTO WINNIPEG

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$32.46
Lake Superior charcoal, Chicago	40.50
Standard low phosphorous, Phila.	33.25
Basic, Valley furnace	30.00
Bessemer, Pittsburgh	33.96

Canadian Foundry Pig—

	Mont.	Tor.
No. 1	$40.14	$39.25
No. 2	39.19	38.16

NEW METALS

	Mont.	Tor.
Lake copper	$19.00	$19.50
Electro copper	18.50	19.00
Casting copper	18.00	19.00
Tin	44.00	46.00
Zinc	8.50	9.00
Lead	7.50	8.00
Antimony	8.00	9.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$10.50	$ 9.00
Copper, crucible	13.00	11.00
Copper, heavy	12.00	11.00
Copper, wire	12.00	11.00
No. 1 mach. comp.	11.00	9.75
New brass cuttings	7.00	8.00
Red brass cuttings	8.00	8.00
Yellow brass cuttings	7.00	6.00
Light brass	5.00	5.00
Medium brass	6.50	6.00
Scrap zinc	4.50	4.00
Heavy lead	4.50	4.00
Tea lead	2.50	2.00
Aluminum	10.00	10.00
	Per gross ton	
Heavy melting steel	$14.00	$14.00
Boiler plate	11.00	12.00
Axles (wrought iron)	25.00	20.00
Rails	15.00	14.00
Malleable scrap	20.00	20.00
No. 1 mach. cast iron	30.00	25.00
Pipe, wrought	8.50	8.00
Car wheels	30.00	25.00
Steel axles	20.00	18.00
Machine shop turnings	8.00	6.00
Stove plate	23.00	20.00
Cast borings	8.00	7.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¾
Acid, nitric	.10
Acid, sulphuric	.03¾
Ammonia, aqua	.15¾
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.16
Copper, carbonate, anhy.	.35
Copper, sulphate	.10
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.16
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite, per cwt.	6.50
Sodium phosphate	.15
Tin Chloride	.80
Zinc Chloride C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.50
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.08¾
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09½
Crocus composition	.12
Emery composition	.10
Rouge, silver	.64
Rouge, powder, nickel	.38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$35.00	$37.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	40.00	44.00
Copper sheet, tinned, 14x 60, 14-oz.	43.00	46.00
Copper sheet, planished, 16 oz. base	47.00	50.00
Braziers', in sheets, 6x4 base	39.00	42.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$10.50	$14.50
Sheets, 3½ lbs. sq. ft.	10.25	14.00
Sheets, 4 to 6 lbs. sq. ft.	10.00	13.50
Cut sheets, ½c lb. extra.		
Cut sheets to size, 1c lb. extra.		

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 7.50	$ 7.50
Sheets, black, No. 10	6.50	6.50
Can. plates, dull, 53 sheets	13.00	13.00
Can. plates, all bright	14.00	14.00
Queen's Head, 28 B.W.G.	13.50	...
Fleur-de-Lis, 28 B.W.G.	12.50	...
Zinc sheets	16.50	20.00

Pittsburgh Markets

PITTSBURGH, February 3. — There has been a slight increase in production by independent steel mills as a whole, the average rate of output by independents now being in the neighborhood of 30 per cent., against a 25 per cent. average for several weeks. The increase in production, however, does not seem to reflect any definite increase in demand, but seems due rather to several mills chancing to resume work at the same time, after a spell of idleness in which they allowed orders and "releases" to accumulate, the releases being withdrawals of instructions previously issued to discontinue shipments on old orders. At some time in the future several mills may chance to go down entirely at the same time, and then a particularly low operating rate will be shown.

The Steel Corporation is operating at an average of about 90 per cent., on the basis of the steel ingot production. Operations have decreased slightly of late by the American Steel & Wire Company, Illinois Steel Company (operating also the Gary plant) and the Tennessee Coal, Iron & Railroad Company. The National Tube Company continues to operate full. The Carnegie Steel Company has been maintaining an average output of ingots 96 per cent. of rated capacity, and last week blew in an additional blast furnace, making 48 Carnegie stacks in operation, the largest number for months. The American Sheet & Tin Plate Company, an important subsidiary of the Steel Corporation, but one that makes very little steel, maintains its former rate of operation at its tin plate mills, but has tapered off slightly in sheet mill operations.

There is no certainty that the Steel Corporation will be able to maintain even approximately its present rate of operation for any length of time. The large mass of business the Steel Corporation accumulated on books last year has proved very sound except for a small volume of cancellations, much sounder than the independent steel producers expected would prove to be the case whenever the steel situation should turn easy, but that would not prevent the buyers from requesting that shipments be made at a slower rate. The consumer may be able and anxious to take every ton on his contract, but his rate of operation might be such as to require that deliveries originally intended to be completed by June 30 should be strung out to December 31.

Pig Iron and Coke

Valley foundry iron has become readily available at $30, furnace, or $1.50 decline, Bessemer and basic being altogether inactive and therefore remaining at $32 and $30 respectively. Most of the merchant furnaces are idle and the few in operation are facing the prospect of having to blow out.

The better balanced mentally of the merchant furnacemen are taking no interest in pig iron prices at this time

STEEL & IRON PRODUCTS

Quality

Service

OF EVERY DESCRIPTION

HAMILTON PIG IRON

Basic Malleable Foundry

STEEL AND IRON BARS

OPEN HEARTH STEEL SHEETS

RAILROAD TRACK MATERIAL

Angle Bars Track Bolts Tie Plates Tie Rods Spikes

SCREWS	WIRE	NAILS
Steel	Steel and Brass, Copper and	Wire
Brass	Bronze, Heavy and Fine,	Cut
Bronze	Bright, Annealed, Coppered,	Boat
Wood and	Galvanized, Tinned, Stranded,	Horseshoe
Machine	Steel and Copper Cable,	Shoe Nails
Screws	Barb, Woven Clothes Line	Tacks

POLE LINE HARDWARE

Pole Steps Cross Arm Braces Guy Clamps Guy Rods

WROUGHT PIPE	FORGINGS	LEAD PRODUCTS
Black Pipe	Car Axles	Lead Pipe
Galvanized Pipe	Shape and Drop Forgings	White Lead
Nipples	Carriage and Automobile	Shot
Couplings	Hardware	Putty

BLOOMS
BILLETS
PLOW BEAMS
ANGLES
CHANNELS

THE
STEEL COMPANY
OF
CANADA
LIMITED

HAMILTON MONTREAL

WIRE RODS
HORSE SHOES
FENCING
RIVETS
BURRS

CLASSIFIED ADVERTISEMENTS

TWO CENTS A WORD. Minimum charge is $1.00 for 50 words or less. Ads. set in border are at the card display rates.

FOR SALE

FOR SALE—ONE OIL BRASS MELTING FURnace with self-contained motor, 110 volts, S.P. 60 cycles, Hawley down draft pattern; capacity four hundred pounds; in first-class order. First cheque $500. Apply to the McClure Optical & Manufacturing Reg'd., 109 St. John St., Quebec. P.Q. (c4f)

PUT YOUR MATERIAL ON A SHANTZ TRUCK while moving through the shop. It will pay you. Factory trucks of all kinds and special sizes and styles to order promptly. Jobbing castings. P. E. Shantz, Preston.

FOR SALE—GRAND ROTARY SAND RIDDLE. Absolutely new. Box 1021, Canadian Foundryman. (cmf)

TUMBLING, TILTING AND BURNISHING barrels for sale. Made in Canada. Box 2021, Canadian Foundryman. (cmf)

FOR SALE—SHOVELS, BRASS AND GALVANized Riddles, Bellows, Core Ovens, etc. Write for particulars to Box 3021, Canadian Foundryman. (cmf)

IF YOU HAVE IRONWORKING OR WOODworking machines for sale, call or write Canada's largest dealers in new and used machinery. Write, mentioning Canadian Foundryman, to H. W. Petrie Ltd., Toronto. (cff)

USED AND NEW WOODWORKING MACHINERY, also metal lathes and small tools, belting and transmission. Write, mentioning Canadian Foundryman, to General Machinery Co., 67-69 Frederick St., Toronto. Main 2200. tf.

FOR SALE—AUTOMATIC ROTATING TABLES, most durable constructed table made. Write, mentioning "Canadian Foundryman," for particulars to Mussens Limited, Montreal (crf)

SITUATIONS WANTED

DRAUGHTSMAN AND PATTERNMAKER DEsires change. First-class practical shop mechanic. Age 30. Married. If you are looking for a young man of ability who can give you a single or two-fold service, let us arrange an interview. Box 14121, Canadian Foundryman. (c2f)

SITUATIONS VACANT

CLEANING AND FINISHING FOREMAN FOR large malleable iron foundry in New York State, producing journal boxes and railroad castings. Must be able to handle 100 to 150 tons of castings daily—turn out work accurately finished to gauges, maintain all operations on piece work basis, and keep castings continuously moving from tumblers to shipping platform. Opportunity to become connected with a permanent and stable organization. Address Box No. 6221, Canadian Foundryman, Toronto, Ont.

WOODSHAPER — FIRST-CLASS MAN — TO operate woodshaper on brush blocks; fine work; one with experience on brush work preferred; steady employment. Write or apply, mentioning "Canadian Foundryman," to Stevens-Hepner Co., Ltd., Port Elgin, Ont. (cmf)

PATTERNS

LET US SOLVE YOUR PATTERN PROBLEMS. Wood and metal models and aluminum plate work. Write, mentioning Canadian Foundryman, to the Hamilton Pattern Works, 120 Adelaide St. W., Toronto. (crf)

WOOD AND METAL PATTERNS—OUR WORK is good and prices right. Give us a try. Write for particulars, mentioning "Canadian Foundryman," to Downer Pattern Works, 1-3 Jarvis St., Toronto.

MACHINERY WANTED

WANTED—1—10 H.P.—GENERAL ELECTRIC or Westinghouse motor—60 cycle—3 phase, 440 volts—1200 R.P.M. The Frost & Wood Co., Ltd., Smith's Falls, Ont. (c2f)

WANTED FOR CASH—WOODWORKING MAchinery of every description. Box 4121, Canadian Foundryman. (cff)

ELECTRIC MOTORS WANTED FOR CASH — Fisher Electric Co., new warehouse, 77 Front Street East, Toronto, Ont., Main 3288. (cmf)

YOUR DEPARTMENT OF SERVICE
Canadian Foundryman
Classified Advertisement Section
143 UNIVERSITY AVE., TORONTO
PHONE ADELAIDE 5740

Bailey & Bell Fire Brick Co.
Manufacturers and Importers of High Grade Fire Brick, Fire Clay and General Supplies. Special Shapes, Cupola Block, Stoker Brick, Boiler Tiles, Stove and Quebec Heater Linings.
MADE IN CANADA
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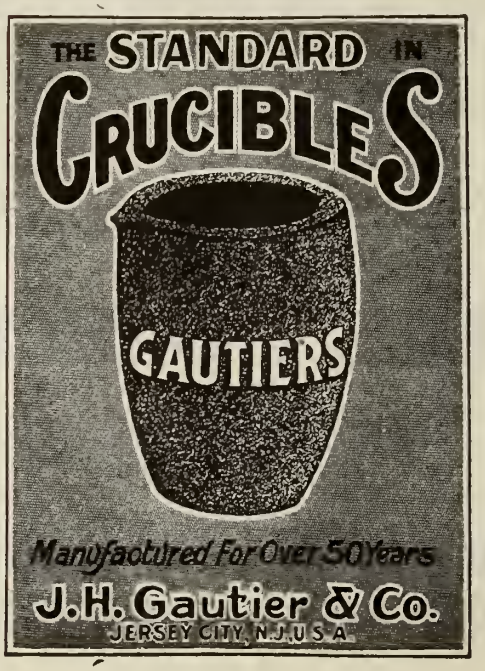
Canadian Pattern & Castings Co. Ltd.
49 Drouillard Road
FORD CITY, ONTARIO
Wood and Metal Production
PATTERNS
Brass, Bronze and Aluminum
CASTINGS
In Production Quantities



NEW ELECTRIC MOLDING MACHINE

(Continued from page 25)

around their pinions. In this one revolution the squeeze is applied to the mold and the pattern drawn. At the half way point, i.e., when the crank heads are in their lowest position and the pinions at their apex, the mold is under powerful compression. At this instant the clamp bar automatically releases and drops to a position in the machine base.

Pattern draw: This follows the squeezing operation without stopping the machine. By the dropping of the clamp bar at the point of greatest compression, the flask sections are of course disconnected from the cradle and remain on the table rests beneath. Proceeding without stop, the crank head motion smoothly raises the cradle, to which the patterns are still attached. neatly drawing them from the cope and drag halves of the mold. An electric vibrator is part of the equipment.

The clutch is again thrown out as the cradle reaches its highest point of travel. Next the steel table rests are released by an automatic trip and swung outward, leaving space for the operator to remain standing between. Cores are now set, the mold closed in the usual way, and then placed on the floor for pouring.

SEAM ROLLING MACHINE

The Winterhoff Tool and Machine Co. of Elkhart, Ind., have placed on the market a new product.

This machine was designed for rolling brazed seams that are joined by notched teeth that hold seam lapped while being brazed.

These tubes after being brazed are placed on a hardened steel mandrel, either square or round as to shape of tube, the mandrel acting as an anvil is placed on table with seam to roll table carried tube under roll, thus making an even planished seam.

The table travels at a speed of six feet per minute and is driven by means of rack and back gearing. Machine is reversed or stopped at end of stroke, or as to length of tube by means of counter shaft with friction clutch pulleys. Roll is raised or lowered by means of a hand wheel operating three gears on raising screws. Hand wheel is graduated in thousandths.

EVER-HOT SOLDERING IRON

The Peterson-Plummer Manufacturing Company are now making an ever-hot soldering iron which is light in weight and a convenient size for every requirement. The gasoline is contained in a reservoir in the handle which is made of seamless brass tubing, the pump being located at the outer end. The flow of gasoline is through cotton wick contained in a rustproof iron pipe between the handle and the burner. The burner is so designed that it may be used effectively in any kind of weather or high winds. The iron is fitted with one large and one small point.

HOLLAND PRODUCTS
Are Real Money Savers

Core Oil

Just because you have a large percentage of defective castings at every pour, don't consider this condition as necessary. Holland Core Oils will reduce your losses to a negligible quantity.

Made in five grades — Big Stick, Regular, Old Regular, Special No. 1, and Extra Fast Drying. These grades efficiently handle every phase of core making for grey iron, malleable, steel, aluminum and brass.

Holland Straight Tripoli Parting

Use nothing but the genuine article. All others are "mere make-shifts," and will always make you trouble, while Holland Straight Tripoli Parting will not only produce smooth, clean surfaces to your castings, but will go much farther because of it being so light and finely milled. Its uniformity in quality and color is a safeguard to all foundrymen. Order a barrel to-day and be convinced of our statements.

Holland Products are expressly made to reduce costs and at the same time improve the quality of the work. Why not give them a trial?

HOLLAND CORE OIL COMPANY

4600 W. HURON ST. CHICAGO, ILLINOIS

Canadian Agents:

The Dominion Foundry Supply Co., Ltd.

EVERYTHING FOR THE FOUNDRY

Toronto, Ont. and Montreal, Que.

Where Profit Begins

The Grand Rotary Sand Riddle

Will pay for itself many times over in the saving of labor alone. The machine sifts sand wet or dry, and does its work quickly and thoroughly in one operation. The patent tapping device keeps machine from clogging in wet material. The tapper can be set to strike a light, medium or heavy blow, or can be thrown out of operation entirely.

The front legs of the machine are adjustable and may be lowered to give any pitch desired to the drum. This is a great advantage in screening and mixing core sand that has just been mixed with oil, as all lumps are broken up before reaching end of drum.

ONLY REQUIRES TWO MINUTES TO REMOVE ONE DRUM AND REPLACE WITH ANOTHER OF DIFFERENT MESH. THE COST PER HOUR FOR ELECTRIC POWER IS ONLY TWO CENTS.

THE MACHINES ARE MADE IN MOTOR BELT OR HAND POWER
PROMPT DELIVERIES ARE BEING MADE ON ALL SIZES

FOR DURABILITY, PORTABILITY AND EASE OF OPERATION, THE GRAND ROTARY SAND RIDDLE IS IN A CLASS BY ITSELF.

Send for Circulars, Prices, etc.

The Beyer Machine Company

Jackson, Michigan

GEO. F. PETTINOS
FOUNDRY SUPPLIES
PHILADELPHIA

FOUNDRY FACINGS

Our facings are manufactured from the best qualities of Plumbago and we guarantee satisfactory results from their use in your foundry. A grade to suit your individual requirements can be furnished from our large list of standards. Every barrel shipped has back of it our 27 years' practical experience. The three leading brands are:

GEOGRAPH PLUMBAGO FACING
CEYLOGRAPH PLUMBAGO FACING
MEXIGRAPH PLUMBAGO FACING

ARMOR BLACKING AND CORE WASH

George F. Pettinos
Real Estate Trust Building - Philadelphia, Pa.
Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

Results!

A small advertisement inserted in the Classified section of Canadian Foundryman will bring good results. And all this for the sum of one dollar. Try it!

Canadian Foundryman
143 University Ave.
Toronto

CRUCIBLE service and economy are direct results of proper care and handling. You get out of a crucible what you put into it. Careful handling means longer service, while careless handling means fewer heats.

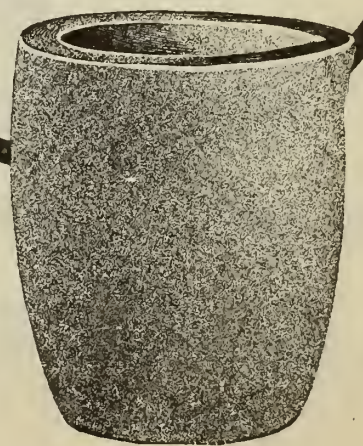
DIXON CRUCIBLES

Dixon Crucibles have built into them that quality which, if cared for, develops long life, economy, and many heats.

Write for Booklet No. 27 A.

Joseph Dixon Crucible Company
JERSEY CITY, N.J., U.S.A.

Established 1827



It Pays to Keep Posted!

If you are not a subscriber to Canadian Foundryman and Metal Industry News it will pay you to become one.

If you are a regular reader, you'll appreciate the value of the information to be secured. Pass the good word along to your friends.

Order now and keep abreast of the times.

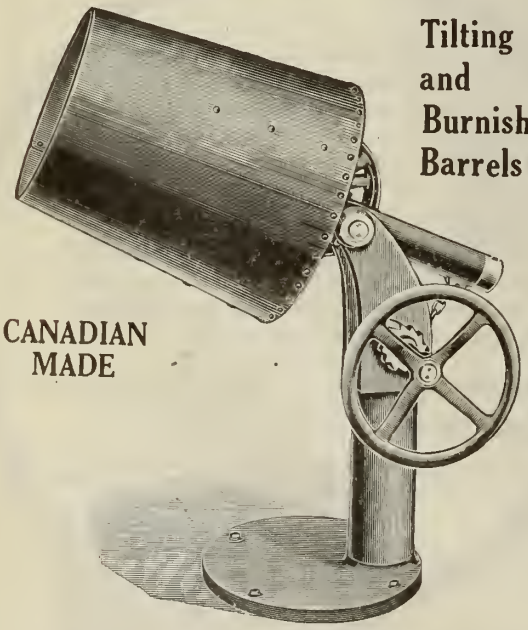
Canadian Foundryman is Canada's oldest exclusive foundry paper. It is well established, well edited, well connected.

A careful study of its pages each month will serve to keep you posted on all that's new and worth knowing in foundry circles.

Subscription Price $2.00 per Year
To United States, $2.50 per Year

CANADIAN FOUNDRYMAN
143 University Ave., Toronto, Ont.

Tumbling Barrels



Tilting and Burnishing Barrels

CANADIAN MADE

SLATER & BARNARD
LIMITED
Hamilton, Ontario

WHITEHEAD'S KAOLIN

For lining and patching the Cupola, Furnace, Ladles, etc., will save fire brick and the time of your men.

E. B. FLEURY
Agent
1609 Queen St. W.
Toronto, Ont.

Patterns!

Phone Adelaide 5439

PUT your pattern problems in our hands. Quality work and prompt service assured. Patterns made for all foundry purposes---wood and metal, models and aluminum plate work.

The A. J. HAMILTON
PATTERN WORKS
120 Adelaide Street West, Toronto

Buffalo Brand VENT WAX

Easiest and Best Way to Vent Any Core

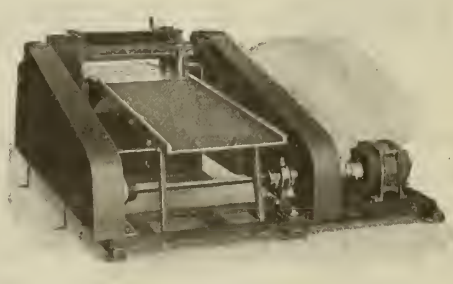
Buy It in Canada at

Dominion Foundry Supply Co., Ltd., Montreal and Toronto.
E. B. Fleury, 1609 Queen St. W., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Standard Machinery & Supplies, Ltd., Montreal, Que.
Webster & Sons, Ltd. Montreal, Que.
E. J. Woodison Co., Toronto, Ont.

Give it a trial

The "Oliver" Surface Planer

is completely guarded. Note the direct connected motor and countershaft on sliding base, also the receiving table.



The workmanship and design of this surfacer will meet the approval of the most critical.

Oliver Machinery Co.
Grand Rapids, Mich., U.S.A.

SCARFE'S No. 7 CORE OIL

SCARFE & COMPANY, LIMITED

Makers of Industrial Varnishes and Paints

Head Office: BRANTFORD *Branches:* MONTREAL and WINNIPEG

REYNOLDS

FOR GOOD

CORE OIL

The Best—and Why

We have concentrated many years of experience in making one grade of core oil. Naturally we have aimed to produce the BEST! That we have succeeded is borne out by the satisfaction it always gives. Highest grade for 20 years. Write for prices.

REYNOLDS & COMPANY

261 Macdonell Ave.
TORONTO

Frost

Wet Pan Sand Mill

for Steel Foundries

The Frost Mfg. Co.

112 W. Adams St.
CHICAGO

Speed and Ease Accomplished on a Heavy, Rigid

FORD-SMITH GRINDER

Heavy Type Floor Grinders

Our new line of floor grinders has been designed to put these machines on a really efficient basis. All types are of the strongest and most rigid construction. Even the highly skilled mechanic will find a great difference in the quality of work and the ease and speed with which it is done.

Full specifications, prices and photographs will be mailed upon request.

The Ford-Smith Machine Co., Limited
HAMILTON, CANADA

Foreign Agents: W. E. Storey, London, Eng. Gollin & Co., Melbourne, Australia
British & Canadian Hydraulic Tube Co., Johannesburg, South Africa McLeod & Co., Calcutta, India

McLain's Semi-Steel is the Key

To Foundry Profits To-day Because It is Used For the Very Lightest Pistons and Cylinders as Well as Castings of Heavy Section.

By the use of semi-steel instead of gray iron, savings are effected by:

A **reduction in section** without reducing the strength of castings, resulting in a lighter casting;

A **more readily machinable** casting reducing the machining cost;

A **superior product** resulting in **increased business;**

A mixture of **higher grade metal at less cost.** For instance:

Mr. McLain was acting in an advisory capacity to a concern using 20 tons of 60 per cent. pig and 40 per cent. No. 1 scrap, using the same mixture throughout the heat. He made three separate mixtures instead at a saving of $120 per **heat.**

COST OF THEIR MIXTURE.

60% pig	@	$45..	$27.00
40% gray scrap	@	35..	14.00
			$41.00

COST OF NO. 1 McLAIN MIXTURE.

40% pig	@	$45..	$18.00
40% gray scrap	@	35..	14.00
20% steel	@	25..	5.00
			$37.00

COST OF NO. 2 McLAIN MIXTURE.

30% pig	@	$45..	$13.50
40% gray scrap	@	35..	14.00
30% steel	@	25..	7.50
			$35.00

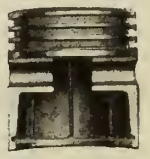
COST OF NO. 3 McLAIN MIXTURE.

20% pig	@	$45..	$ 9.00
40% gray scrap	@	35..	14.00
40% steel	@	25..	10.00
			$33.00

McLAIN'S SYSTEM is an absolute GUARANTEE to better foundry practice and SEMI-STEEL.

Send for free Synopsis.

McLAIN SEMI STEEL



DELUXE PISTON
10% STEEL

McLAIN'S SEMI-STEEL

AUTOMOBILE PISTON
25% STEEL

McLAIN'S SEMI-STEEL

LIBERTY MOTOR PISTON
15% STEEL

FILL IN AND MAIL COUPON TO-DAY.

McLAIN'S SYSTEM, INC., 700 Goldsmith Bldg., Milwaukee, Wis.

I am interested in
- Semi-steel
- Gray Iron
- Cupola Practice

STEEL
- [ ] Crucible
- [ ] Converter
- [ ] Electric
- [ ] Open Hearth

Name .....
Address .....
Firm .....
Position .....

2-21

McLAIN'S SYSTEM, INC.

700 Goldsmith Bldg. Milwaukee, Wis.

Of Interest to Every Canadian

Number One of a Series of Advertisements

Efficient service is the keynote of membership of

CANADIAN FOUNDRYMAN

—IN—

Canadian National Newspapers and Periodicals Association

—a highly constructive service—absolutely dependable and devoid of prejudice and personal bias. It means much to you!

The policies and principles back of this important service enable you to secure practical and impartial information of great value in business and in the home: and they assure a ready fund of literature of exceptionally high standard at all times.

To read the Association's Standards of Practice listed herewith is to understand what this Association means to you.

Standards of Practice

Canadian National Newspapers and Periodicals Association

THE Members of this Association shall dedicate their best efforts to the cause of business, and public service, and to this end shall pledge themselves:

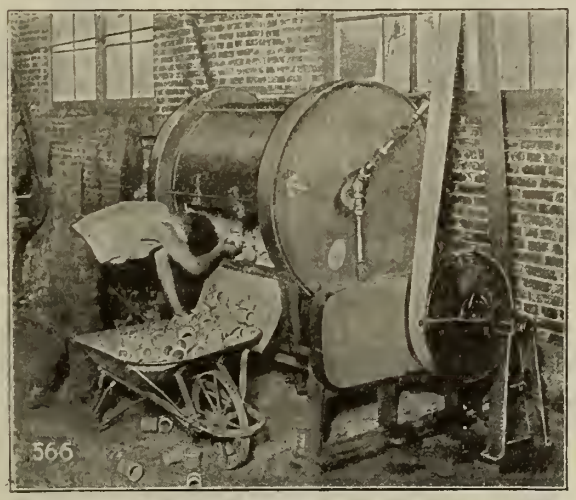
1. To consider first the interests of the Subscriber.
2. To work for truth and honesty in all departments.
3. To eliminate, in so far as possible, their personal opinions from their news columns, but be leaders in thought in their editorial columns, and make their criticisms constructive.
4. To refuse to publish puffs, free reading notices, or paid write-ups, to keep their reading columns independent of advertising considerations, and to measure all news by the standard "Is it real news?"
5. To decline any advertisement which has a tendency to mislead, or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements, subject to proper authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function in the field which they serve, and then to strive, in every legitimate way, to promote that function.

This is Number One of a series of advertisements regarding an Association that typifies thorough-going Canadian stability. Read theforthcoming advertisements in the Magazines and Agricultural, Business, Religious and Educational newspapers, and Technical newspapers.

Canadian National Newspapers and Periodicals Association

Office - 70 Lombard Street - Toronto, Ontario

Sand Blast Tumbling Barrels



These barrels provide the most efficient and economical method for cleaning small castings that will permit tumbling.

They are made in many sizes and types for all kinds of castings.

Let us convince you why they are capable of cleaning a greater tonnage than most other barrels on the market.

Our engineering force is at your service. Give us complete data of the work to be cleaned and we will recommend and guarantee the best equipment for your requirements.

Send for Catalogues.

Mussens Limited

Montreal **Toronto** **Winnipeg** **Vancouver**

TABOR

10″ POWER SQUEEZER

We have had 92 of these machines operating in one shop for over nine years, and the total cost of repair parts ordered has been less than $10.00 — a striking tribute to TABOR QUALITY.

Send for Bulletin M.R.

There Is No Faster Machine Made

THE TABOR MANUFACTURING COMPANY, 6225 STATE ROAD, TACONY, PHILADELPHIA, U.S.A.

SLY FOUNDRY EQUIPMENT "UP - TO - DATE"

30/40 Sand Blast Mill at Olds Motor Works, Lansing, Mich.

Is the Finishing of Small Parts and Castings Costing You Too Much?

Here's a profit leak that bears close analysis. The cost of small parts may become out of proportion to the cost of larger parts unless they are finished in sufficient volume in the least possible time and with the minimum amount of labor.

Since cost depends on volume, where 6 or 8 tons a day have been cleaned by one method or another, the installation of a 30/40 Sly Sand Blast Mill actually turns out 8 to 20 tons a day and with the minimum amount of labor.

Drop forgings, stampings, small gears, auto parts, brass and bronze work and malleable iron castings that are put through a 30/40 Sly Sand Blast Mill are cleaned with the thoroughness of a sand-blasting operation that imitates hand work, lessening machining on parts that are to be machined; eliminating defective parts; giving a surface that is ready for plating.

It is your privilege to draw on over forty years' experience in the business, by putting your cleaning problem up to us. Write or wire

The W. W. SLY Mfg. Co.

New York, Washington, Birmingham — *Main Office and Works:* Cleveland, Ohio, Paris, France — Chicago, Detroit, St. Louis

Other SLY Products

Steel Tumbling Mills
Iron Cinder Mills
Brass Cinder Mills
Resin Mills
Sand Blast Mills
Sand Blast Mills—Tilted
Exhaust Fans
Sand Blast Rooms
Sand Blast Cabinet
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers

Berkshire Molding Machines

Reduce Molding Cost

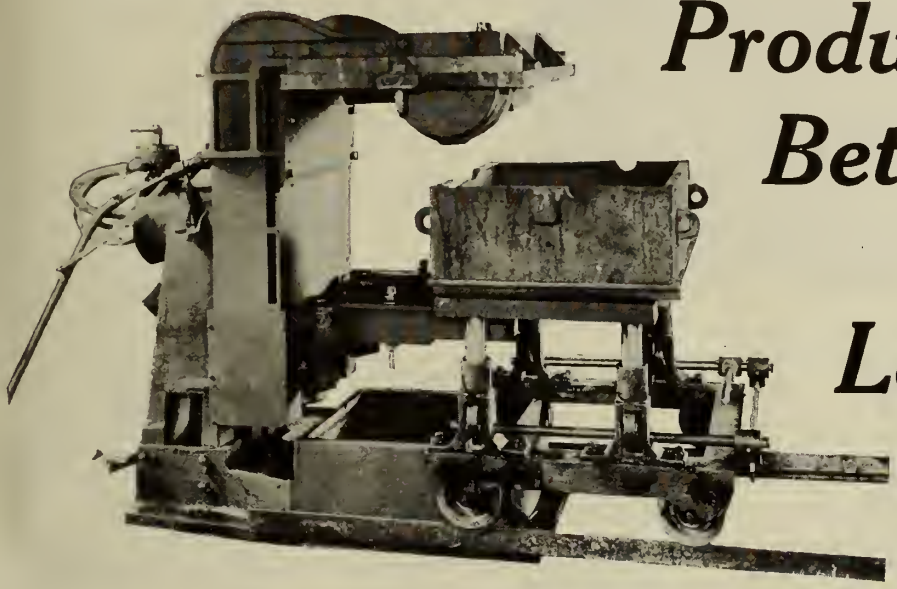
Showing a Berkshire Portable Air Squeezer with pattern-drawing device turning out molds in one of the largest foundries on the Continent. Berkshire machines will increase your production 50 to 100 per cent. and give you perfect satisfaction.

The Berkshire Mfg. Co.

Cleveland Ohio

GRIMES

JAR-RAMMED ROLL-OVER MACHINE



Produce Better Castings for Less Money

Simplicity of Design
Ease of Operation
Low Cost of Installation

No Pits to Clean
Small Floor Space Required
Entirely Above Floor Level

These features assist in making Grimes Molding Machines the best on the market.

Grimes are made in many different types in both hand and power models up to 5,000 lbs. capacity, for use on a wide variety of work.

Grimes Molding Machines have solved many a hard molding problem. Let them solve yours. Write us to-day.

GRIMES MOLDING MACHINE CO.

5738 Hastings St. **DETROIT, Mich.**

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

If what you want is not listed here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

ABRASIVE MATERIALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont
Ford-Smith Mach. Co. Ltd., The, Hamilton, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J. C., Toronto, Ont.

AIR COMPRESSORS
Holden Co., Ltd., The, Montreal.
Mussens, Ltd., Montreal, Que.

AIR DRILLS
Holden Co., Ltd., The, Montreal.

AIR HOIST
Holden Co., Ltd., The, Montreal.

AIR HOSE
Holden Co., Ltd., The, Montreal.

ALBANY SAND
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

ALLDYS
Stevens, Frederic B., Detroit, Mich.

ANODES, BRASS, COPPER, NICKEL, ZINC
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

ARGON
Dom. Oxygen Co., Toronto, Ont.

AUTOMOBILE MACHINERY
Preston Woodworking Machinery Co.

BAND SAWS
Oliver Machinery Co., Grand Rapids, Mich.

BARRELS, TUMBLING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Pangborn Corporation, Hagerstown, Md.
Obermayer Co., S., Chicago, Ill.
Slater & Barnard, Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BARRELS, SANDBLAST
A. C. Leslie & Co., Ltd., Montreal, Que.
Mussens, Ltd., Montreal, Que.
Pangborn Corporation, Hagerstown, Md., U.S.A.

BINDERS, SAND
Holland Core Oil Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich
Woodison, E. J. Co., Toronto, Ont.

BLAST GAUGES—CUPOLA
Chas. J. Clark Meter Co., Gladbrook, Iowa.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BLOWERS
Dominion Fdry. Supply Co., Ltd., Toronto,
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BOILERMAKERS' TOOLS
Holden Co., Ltd., The, Montreal.

BOILER COMPOUND
Reynolds & Co., Toronto.

BOILER GRAPHITE
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Pettinos, George F., Philadelphia, Pa.

BOILERS, STEAM
Ministry of Munitions, London, England.

BOOTS
C. H. Watt, Amherst, N.S.
Ministry of Munitions, London, England.

BORING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

BOTTOM PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

BRAKE SHOES, WHEEL TRUEING
Can. Hart Wheels, Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRASS GOODS, VALVES, ETC.
Crane, Ltd., Montreal.

BRICKS, RUBBING
Can. Hart Wheels, Ltd., Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, FOUNDRY AND CORE
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, O.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.

BURNERS, CORE OVEN
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Can Hanck-Burner, Port Hope, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

CALKING HAMMERS
Holden Co., Ltd., The, Montreal.

CARBON BLACKING
Pettinos, George F., Philadelphia, Pa.
Woodison, Co., E. J., Toronto.
Stevens, Frederic B., Detroit, Mich.

CARS, CORE OVEN AND FOUNDRY
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, NICKEL
Grimes Molding Mach. Co., Detroit, Mich.
Canadian Pattern & Die Castings Co., Ford City, Ont.

CHAIN BLOCKS
Mussens, Ltd., Montreal, Que.

CHAPLETS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS CHEMICALS
Can. Honson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.

CHIPPING HAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CHISEL BLANKS
Holden Co., Ltd., The, Montreal.

CLAMPS, FLASK
Diamond Clamp & Flask Co.
Frederic B. Stevens, Detroit, Michigan.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

CORE BARROWS
Sterling Wheelbarrow Co., Milwaukee.

CORE BINDERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

CORE BREAKERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CORE COMPOUNDS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Mich.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Blystone Mfg. Co., Cambridge Springs, Pa.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip Co., Akron, O.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Scarfe & Co., Ltd., Brantford, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE SAND MIXER
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip Co., Akron, O.

CORE SAND MIXERS AND SAND MIXING AND COMPOUND MILLS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Hamilton.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE REDUCERS
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE TAPERING AND CUTTING-OFF CORE TESTING MACHINE
Wadsworth Core Machine & Equip. Co., Akron, O.
National Engineering Co., Chicago, Ill.

CORE WAX
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CUTTERS, CORE
Wadsworth Core Machine & Equip. Co., Akron, O.

CRANES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Mussens, Ltd., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES
J. H. Gautier Co., Jersey City, U.S.A.
Frederic B. Stevens, Detroit, Mich.
Woodison Co., E. J., Toronto, Ont.

CUPOLAS
Bailey & Bell Fire Brick Co., Toronto, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

DOWEL PINS
Diamond Camp and Flask Co.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRAWBAR CENTERING DEVICE
Holden Co., Ltd., The, Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

DRINKING FOUNTAINS
Crane Ltd., Montreal.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Monarch Engineering Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Pangborn Corporaton, Hagerstown, Md.
Sly, W. W., Mfg. Co., The, Cleveland,
Woodison, E. J., Co., Toronto, Ont.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST EXHAUSTER, ANISTER SYSTEM
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Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
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ENAMELWARE
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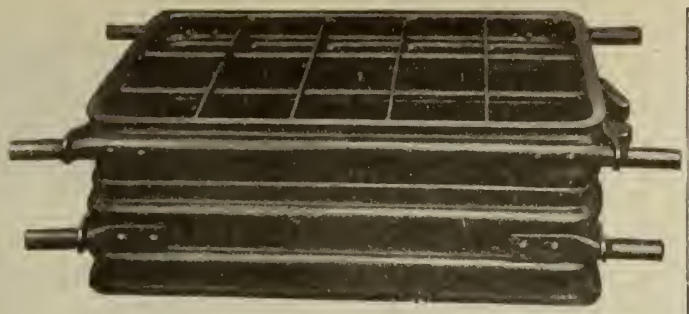
ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.



(Patent Applied For)

TRUSCON FLASK

Dimensions 16½-in. x 26-in.
Cope 6½-in. Drag 3½-in.

Pouring Truscon Flasks in Foundry of Allyne Ryan Foundry Co., Cleveland, Ohio.

Photo by courtesy Allyne Ryan Foundry Co.

DESIGNED FOR THE JOB—

Just as made-to-measure clothes better fit the man, so TRUSCON Flasks, designed for the job, better fit the job.

The advantages of TRUSCON designed-for-the-job Flasks not only keep the weight of the Flasks at a minimum, consistent with foundry usage, but also make possible a saving in the amount of sand required.

The weight of a TRUSCON Flask is often as much as forty per cent. less than a cast iron flask and the savings in the sand required range from ten to fifty pounds per casting, depending upon the size of the Flask.

Write for complete information and estimates.

Special Construction of Truscon Flasks

Truscon Flasks are formed of special Truscon Alloy Steel Plates. The deep ribs and broad flanges give to the steel shell exceptional strength and rigidity. Each rib and flange runs full depth around the corners and reinforces the steel to withstand all strains and stresses to which Flasks are liable on the foundry floor.

Truscon cross bars are formed from steel plates also. They are furnished bolted, welded or riveted to the walls of the Flask as desired.

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TRUSCON STEEL CO., YOUNGSTOWN, O.

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ENGINEERS (FOUNDRY)
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Osborn Engineering Co., Cleveland, O.

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Wadsworth Core Machine & Equip. Co., Akron, O.

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FACING SAND MIXERS AND SAND MIXING AND COMPOUNDING MILLS
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Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

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Pettinos, George F., Philadelphia, Pa.
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Obermayer Co., S., Chicago, Ill.
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Whitehead Bros Co., Buffalo, N.Y.
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Hawley Down Draft Furnace Co., Easton, Penn.

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Hawley Down Draft Furnace Co., Easton, Penn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
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Whitehead Bros., Co., Buffalo, N.Y.
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FURNACES, ELECTRIC
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Holden Co., Ltd., The, Montreal.
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Holden Co., Ltd., The, Montreal.

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GRINDING WHEEL DRESSERS
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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT STEEL
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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Woodison, E. J. Co., Toronto, Ont.

IRON FILLER
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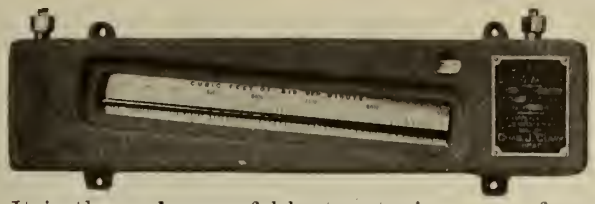

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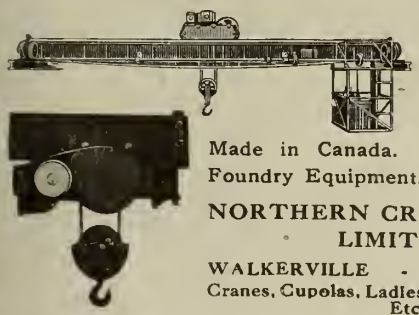

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Woodison Co., E. J., Toronto.

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Frost Mfg. Co., Chicago, Ill.
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National Engineering Co., Chicago, Ill.

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Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.
Pangborn Corporation, Hagerstown, Md.
Sly, W. W. Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Rich.
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Globe Steel Co., Mansfield, Ohio.
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Hamilton Facing Mill Co., Hamilton, Out.
Hyde & Sons, Montreal, Que.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto. Ont.

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Holden Co., Ltd., The, Montreal.

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Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Hamilton, Ont,
National Engineering Co., Chicago, Ill.
Preston Woodworking Machy. Co., Preston, Ont.
Woodison. E. J., Co., Toronto, Ont.

SAND SIFTERS, HAND
Frederic B. Stevens, Detroit, Michigan.
Woodison Co., E. J., Toronto.

SASH LOCKS
Holden Co., Ltd., The, Montreal.

SAW BENCHES
Oliver Machinery Co., Grand Rapids, Mich.

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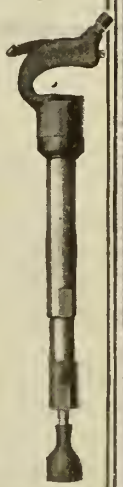

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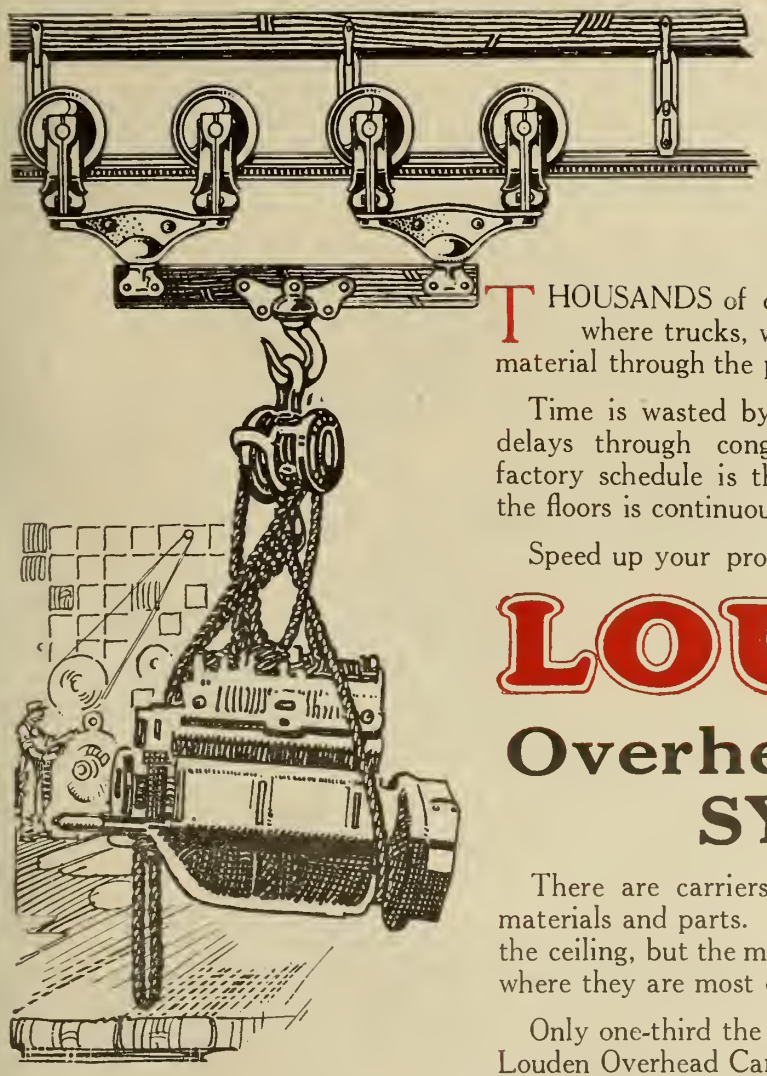

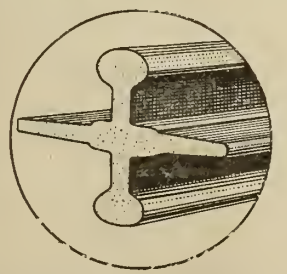

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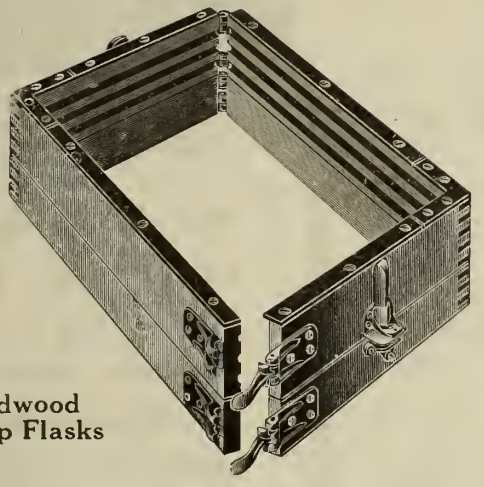
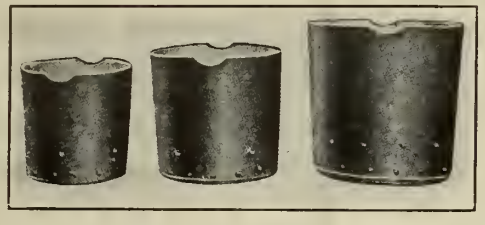
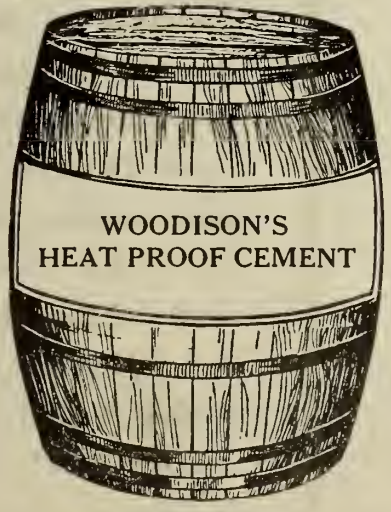


Hardwood Snap Flasks



Flat Bottom Welded Steel Bowls



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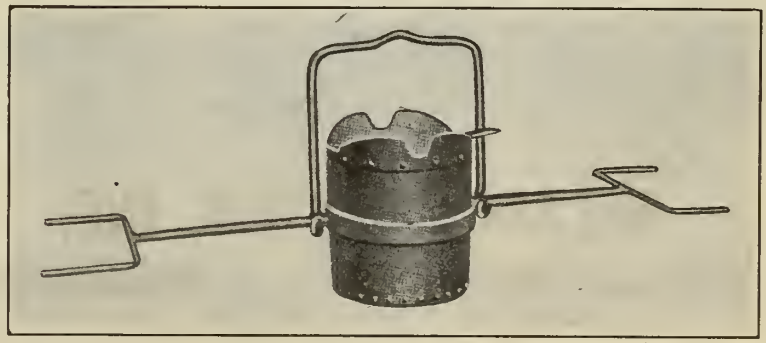

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New ideas flow in from a thousand channels, knotty problems are solved—the very nature of our business keeps us constantly charged with constructive and creative methods. Thus: Indirectly hundreds of the world's best foundrymen and metallurgists have assisted in making our sixth edition the STANDARD FOUNDRY AUTHORITY.

Sentenced for Speeding !

There are no delays when the Monarch Coke Tilting Crucible Melting Furnace shown below is used. It is equipped with Hopper Feed and Shake Grates; rests above ground; made for various sized crucibles. Unequalled for economy and efficiency in its class.

MONARCH
MELTING FURNACES

are before the court of "foundrymen" on a charge of speeding as well as high efficiency in making melts.

MONARCHS have been "speeding" up production in hundreds of foundries. Users and witnesses testify they will melt twice as much metal as ordinary furnaces without additional fuel.

MONARCHS are not only quicker—they are more convenient and efficient, and while not cheap, their cost is low. By conserving both fuel and time, MONARCHS inject economy into every melting operation.

You are the jury in this case. Balance up your present results against the results you **will** get with a Monarch. Weigh the facts carefully. Consider if you can afford to be without a furnace that is at least 50 per cent. more economical than any other.

Monarch Equipment includes (without crucibles) Simplex Revolving, Double Chamber, Duplex, etc.; (with crucibles) Tilting Pit, Stationary Core Ovens, Soft Metal Melting Furnaces, etc.

We would like to tell you more about these record-breaking furnaces. Let us hear from you.

Tilting Coke Crucible Furnace.

Hopper feed, above ground, shake grates.

The Monarch Engineering & Mfg. Company

1206 American Building, Baltimore, Md., U.S.A. **Shops: Curtis Bay**

"That Single Heater, With No Outside Pipes or Ducts, Keeps Our Whole Foundry Warm"

Mechanical Details

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a fan-wheel and heated by exhaust or live steam. Cold air near the floor level is drawn into the heater by the fan, impelled upward and around the coils, and after being heated, is distributed through outlet hoods to every part of the open building space. Where steam is not available, we supply our direct-fired type DF as shown in the large illustration above.

"We used to have all sorts of trouble with our old heating system. Naturally, I was a little bit skeptical until the Skinner salesman told me he would put in his heater on an absolute guarantee to keep all of the foundry warm all of the time—that if it failed we could return it and get back every dollar we paid. I told him to put it in. That was five years ago—since then we have not had a bit of trouble—temperature is always right around 70, our sand never freezes, and the place heats up quickly when the monitor windows are closed after pouring."

Simple in Principle—Economical to Operate

Skinner Bros. (Baetz Patent) Heater is an individual unit built on simple, scientific principles. It has no outside pipes or ducts—is portable—requires no special foundations. Installation cost is 15 to 50 per cent. lower than any other system and with operating cost equally low.

Find out more about this heater. If you wish, we will send you names of users so you can make your own investigation.

Skinner Bros. Mfg. Co., Inc.

1436 S. Vandeventer Ave. St. Louis, Mo.

New York, 1704 Flatiron Bldg. **Indianapolis, 328 Occidental Bldg.**
Boston, 447 Little Bldg. **Minneapolis, 804 Metropolitan Life Bldg.**
Buffalo, 704 Morgan Bldg.

Skinner Bros.
Baetz Patent HEATING SYSTEM

Skinner Bros. Mfg. Co., Inc.,
1436 S. Vandeventer Ave., St. Louis, Mo.

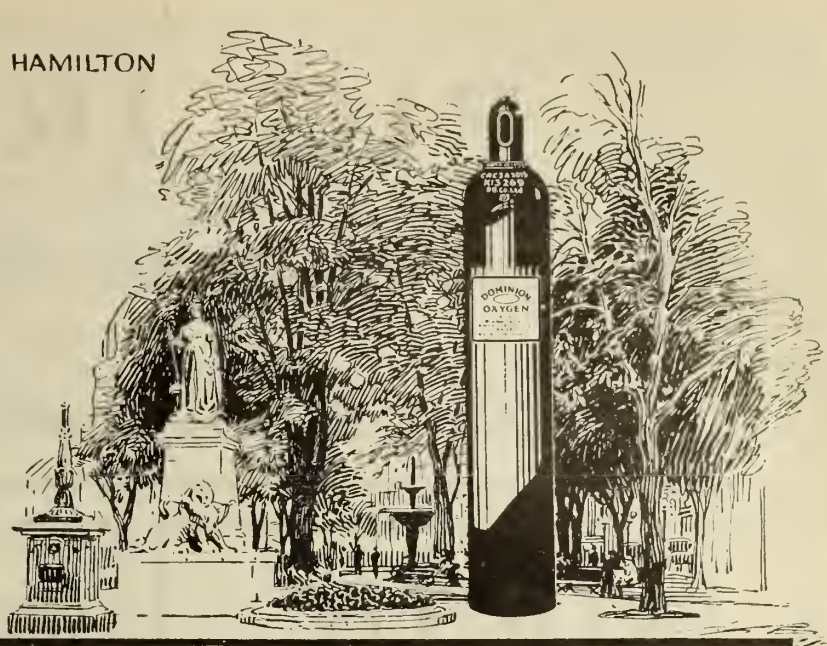
Please send full particulars on Skinner Bros. (Baetz Patent) Heaters to

Firm Name .....

Address .....

For what purpose building used .....

Can you use steam? .....



Dominion Oxygen

when and where you want it

FROM four centrally located points the Dominion Oxygen Company, Limited, supplies Canadian industry with the commercial oxygen it needs. Thanks to the completion of these first four distributing stations, Canadian manufacturers can now rely on a never-failing source of immediate oxygen supply.

Delivery of pure oxygen in any quantity, at any point, at any time, is made certain by Dominion's producing and distributing organization.

The manufacture of uniformly pure oxygen in quantities large enough to insure prompt attention to your needs has been the aim of the Dominion Oxygen Company, Limited, since the formal announcement of its building plans. The fact that every order for oxygen is filled on the day it is received is evidence of the efficiency already reached.

Dominion Oxygen Service is based on the Company's realization of Canada's need of an always available supply of uniformly pure oxygen. Dominion oxygen, in the high capacity cylinder built for economical and safe handling, fills that need.

DOMINION OXYGEN COMPANY, LIMITED

Hillcrest Park, Toronto

Hamilton Montreal Windsor

D-15

PIG IRON

(ALL GRADES)

FERRO MANGANESE—FERRO SILICON

Stock and Import

A. C. LESLIE & CO., Limited, MONTREAL

"VOLTA" Electric Furnaces

ELECTRIC STEEL FURNACES
100 lbs. to 15 tons Capacity

GRAY IRON CASTINGS
Electric Furnaces for making Gray Iron

ELECTRIC BRASS FURNACES
Made in standard sizes of 1/8, 1/4, 1/2 and 1 ton capacity.

Electric Furnace Accessories of All Kinds

In order to meet and overcome strong competition you should reduce your production costs as well as metal losses. This can unquestionably be done by operating an electric furnace. Let us convince you that this is true.

The Volta Manufacturing Company, Ltd.
WELLAND, ONT.

FOUNDRY PRODUCTION

WE DESIGN

Industrial Plants
Power Plants
Foundries
Machine Shops
Bridges
Hospitals
Banks
Public Buildings

AND MAKE

Reports
Estimates
Appraisals

Adequate foundry facilities, ample floor space, proper ventilation and lighting are features in foundry design, which, in connection with operating efficiency, will insure maximum production.

It will pay you to consult us on your foundry problems.

The Osborn Engineering Co.
CIVIL, MECHANICAL, ARCHITECTURAL ENGINEERS
2848 PROSPECT AVE., CLEVELAND, O.

Speed and Ease Accomplished on a Heavy, Rigid FORD-SMITH GRINDER

Heavy Type Grinders

Our new line of floor grinders has been designed to put these machines on a really efficient basis. All types are of the strongest and most rigid construction. Even the highly skilled mechanic will find a great difference in the quality of work and the ease and speed with which it is done.

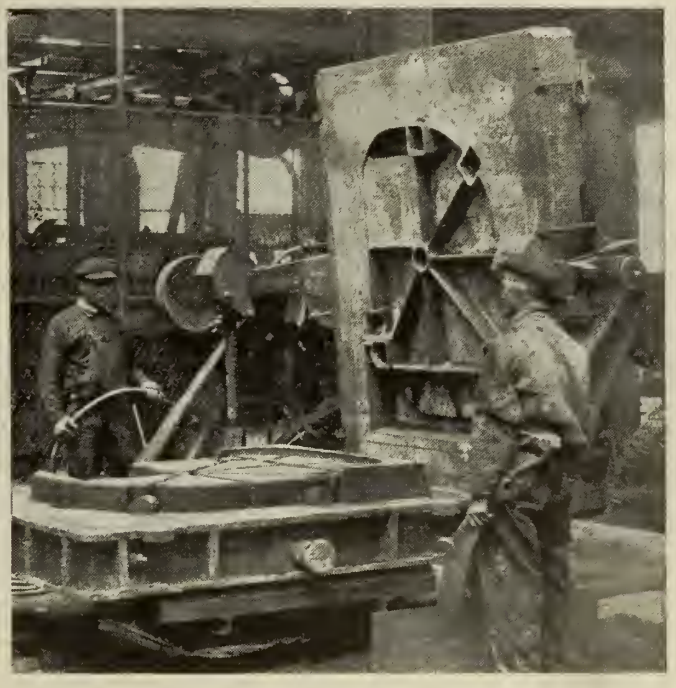
Full specifications, prices and photographs will be mailed upon request.

The Ford-Smith Machine Co., Limited
HAMILTON, CANADA

Foreign Agents: W. E. Storey, London, Eng. Gollin & Co., Melbourne, Australia
British & Canadian Hydraulic Tube Co., Johannesburg, South Africa McLeod & Co., Calcutta, India

If It's a Herman, It's Worth Using, It Made Its Way by the Way It's Made

Our plant is equipped and the design of our Jarr Independent Rollover and Pattern Drawing Machines is such to take care of your work of a medium or larger nature.



We will be thankful if you will send us your inquiry and let our Service Department advise with you on your molding machine requirements for such work.

Herman Pneumatic Machine Company

GENERAL OFFICES: Union Bank Building, PITTSBURGH, PA.

MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U.S.A.

Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London, S.W., Eng.

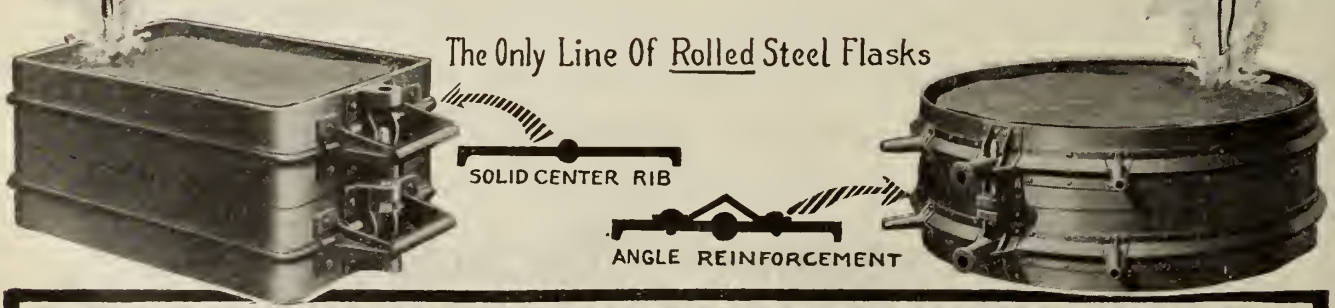
Sterling

Foundry Flask Business Could Have Been 20% Bigger In 1920

That's a fact! For every five orders we filled we declined one. Not because we did not want the business, but we had a doubt if steel flasks would give satisfaction for the job intended.

Throughout our many years of experience we have built a most enviable reputation for furnishing flasks suitable for the work. We are zealous of this reputation—and will be in business not only for 1921 but for many years to come.

Why take chances—better consult Sterling, it pays.



STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

NEW YORK
BOSTON
CLEVELAND

MILWAUKEE, WIS.

CANADIAN AGENTS-MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VANCOUVER

DETROIT
CHICAGO
ST LOUIS

SIMPSON INTENSIVE FOUNDRY MIXER

Economical and Efficient for all kinds of Sand Mixtures

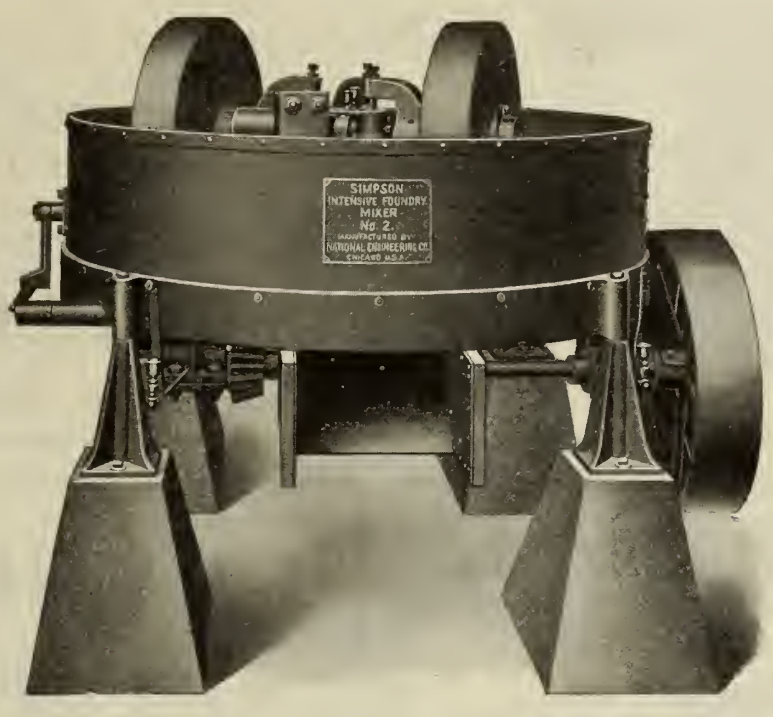
Note the AUTOMATIC DISCHARGE

It saves LABOR BINDER and NEW SAND

It improves the quality of the castings

Its work is done thoroughly not partially

Elasticity and toughness of sand are enormously increased



"The Product of a Practical Foundryman"

Thoroughly amalgamates the mixture

Small H.P. required with a minimum of repairs

Pays for itself in an incredibly short time

Original porosity of sand mixture maintained

Large capacity with a minimum of labor

Will reclaim old and worn out sand and reuse

The large number of Simpson Mixers in use all over Canada and the United States testify to its efficiency. Send for our pamphlet No. 50 and list of many users.

The Six Points of Perfection

1. Correct size and speed of mullers.
2. Effective arrangement of plows.
3. Automatic discharge.
4. Large capacity per area of floor space occupied.
5. Minimum power and maintenance cost.
6. Considerably less new sand and binder required.

NATIONAL ENGINEERING COMPANY

Machinery Hall Bldg., 549 W. Washington St.
CHICAGO, Ill.

TABOR
3-inch Plain Jarring Machine For Small Molds And Medium Sized Cores

3" Tabor Jarring Machine with 12" x 14" Table

A Necessity in Every Foundry

SEND FOR BULLETIN M-J-P

THE TABOR MFG. COMPANY

6225 State Road, Tacony, Philadelphia, U.S.A.

Tumbling Barrels

Tilting and Burnishing Barrels

CANADIAN MADE

SLATER & BARNARD
LIMITED
Hamilton, Ontario

REYNOLDS

FOR GOOD

CORE OIL

The Best—and Why

We have concentrated many years of experience in making one grade of core oil. Naturally we have aimed to produce the BEST! That we have succeeded is borne out by the satisfaction it always gives. Highest grade for 20 years. Write for prices.

REYNOLDS & COMPANY
261 Macdonell Ave.
TORONTO

DOELCAM

SAND BLAST HOSE MACHINES

These machines embody improvements that have been the result of over thirty years in manufacturing them. All parts have been carefully studied so that the wear and upkeep expense in operating are reduced to a minimum.

They are of the positive pressure type made in sizes from 300 to 8,000 pound sand capacity. The tank being under pressure while the machine is in operation, the abrasive on the work to be cleaned is blasted in a most practical and efficient manner.

MUSSENS LIMITED

MONTREAL
TORONTO

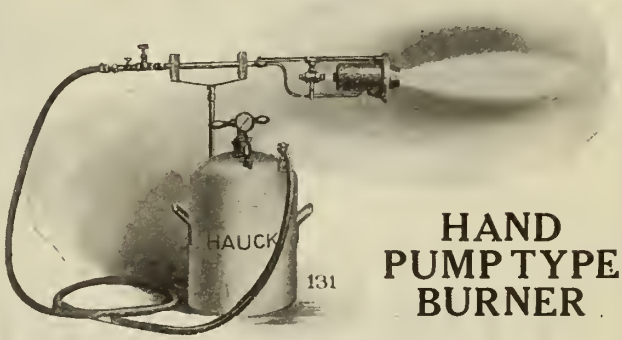
WINNIPEG
VANCOUVER

WHITEHEAD'S KAOLIN

For lining and patching the Cupola, Furnace, Ladles, etc., will save fire brick and the time of your men.

E. B. FLEURY
Agent
1609 Queen St. W.
Toronto, Ont.

HAUCK



HAND PUMP TYPE BURNER

Burns Kerosene (Coal Oil)—No Compressed Air Required.

THIS burner is of the vaporizing type, which must be preheated before starting. Burner is supplied with a heating pan. Starts within three minutes. Recommended where compressed air is not available. Is especially suitable for yard and shop work.

Flame is intense and is easily regulated as desired. Before operating, it is necessary to pump up from 30 to 60 pounds pressure into tank for forcing the oil to the burner; the burner does not use air from tank. Operates two or three hours with one pumping.

The burner is so constructed to minimize the carbonization, all passageways being readily accessible and easily cleaned. Produces an intense, reddish blue flame, which is steady, clean and without smoke or soot.

Most successful pump type burner on the market.
Used daily for years without repairs.

CANADIAN HAUCK BURNER CO., LTD.
PORT HOPE, ONT.

ESSO
TRADE MARK REGISTERED

Px

Peerless Parting Compound gives a perfect lift.
Kantbebeat Core Compound makes a core which won't blow.
No. 702 Pure Ceylon Plumbago peels the heaviest castings.

Obermayer, M.D.

A dose of the above applied daily will insure every foundry against the loss of castings.

We have cures for all your foundry troubles. Write us about them at once.

EVERYTHING YOU NEED IN YOUR FOUNDRY

THE S. OBERMAYER CO.

ESTABLISHED 1874

WAREHOUSES	OFFICES			FACTORIES
Chicago	Chicago	St. Louis	Minneapolis	Chicago
Newark, N.J.	Pittsburgh	Detroit	Los Angeles	Cincinnati
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St. Louis				
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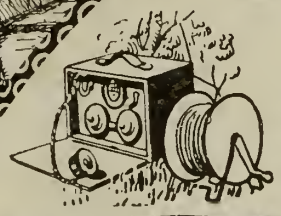
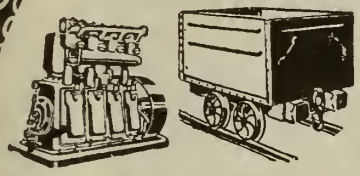
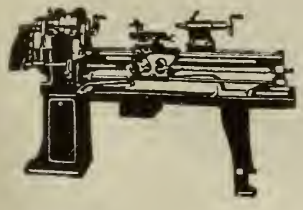
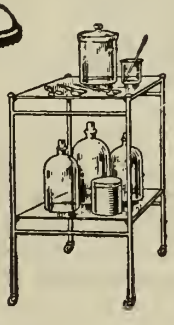
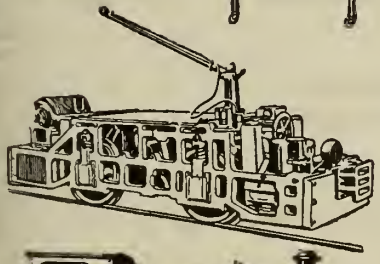
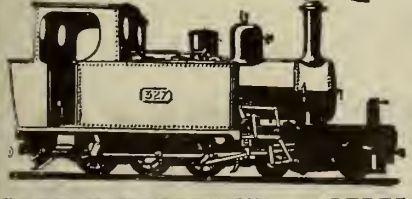
Denver				
Los Angeles				

Canadian Representative: E. B. FLEURY, 1609 Queen Street West, Toronto

G R

MINISTRY OF MUNITIONS

The Disposal Board Have

STOCKS

Lying in the United Kingdom and

AVAILABLE FOR EXPORT of ENGINEERING STORES

- Plant and Machinery
- Steam Engines and Boilers
- Machine Tools
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- Electrical Instruments and Machinery
- Medical Stores
- Chemicals and Explosives
- Road Bridges
- Furniture
- Textiles and Clothing
- Boots and Leather Equipment
- Motor Boats, etc., etc.

Buyers should instruct their representatives in the United Kingdom to communicate with the Secretary Disposal Board, Ministry of Munitions, Caxton House, Tothill St., London, S.W.

Cable Address

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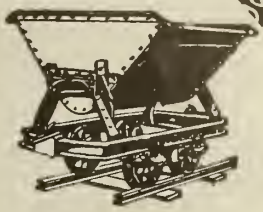
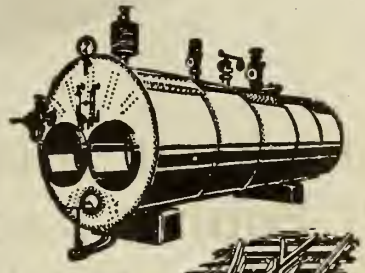
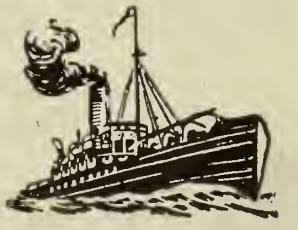






The TRUSCON
Saves Six Tons of Labor Per Day

Are Your Men Handling 40 Pounds Excess Weight Every Time They Pick Up a Foundry Flask?

40 x 4 = 160 lbs.
160 x 75 = 12,000 lbs.
12,000 lbs. = 6 Tons

This is figuratively what they are doing if they are handling cast iron flasks when they might just as well be handling Truscon Pressed Steel (strong lightweight) Foundry Flasks. Most flasks are handled four times for each pouring: Pile to machine, machine to floor, knocked out and back to pile; 40 x 4 equals 160 lbs. Suppose two men working together, handle 75 flasks a day; 160 x 75 equals 12,000 lbs. Six tons of extra weight to be handled. It costs money to move those six tons.

TRUSCON Flasks will save you time, labor, and money. They quickly pay for themselves. Investigate!

TRUSCON STEEL CO. PRESSED STEEL

TRUSCON STEEL CO., Youngstown, Ohio, U.S.A.

Warehouses and Representatives in Principal Cities

TRUSCON FOUNDRY FLASKS

Bigger Profits in Foundry Practice With a PRESTON

This Electric Sand Riddle Finds Profits in Falling Prices

Foundrymen and Manufacturers alike are to-day confronted with the same problem—that of marketing their products at lower prices and still retaining a fair margin of profit.

In looking for a solution, they find that a more extensive use of efficient equipment will give them the quantity production so necessary.

Here is where the Preston Ball Bearing Electric Sand Riddle comes in, for it will riddle sand as fast as a man can shovel it —and all it costs for power is one cent per hour.

OF course, there are other Electric Sand Riddles made. But in the opinion of practical Foundrymen, the Preston is far superior, both as regards capacity and the ease with which it can be run from one part to another of the foundry.

This is not enough. We want your opinion as well, and to do this we are prepared to place a Riddle in your plant on trial, all charges pre-paid, against any other riddle made, and leave it entirely to you to decide at the end of the trial period which riddle is the best proposition for you.

It won't cost you anything to sign your name on the form below and have one come along for a thorough trial on the above understanding.

The Preston Woodworking Machinery Co., Limited,
Preston, Ontario.

Gentlemen:

Please ship us on 15 days' trial by.....freight prepaid one "Preston" Ball Bearing Electric Sand Riddle for.....cycle.....volt current. At the end of the above trial period I am we are privileged to return the riddle if not satisfied in every way.

Name.....

Address.....

The Preston Woodworking Machinery Company, Limited

PRESTON, ONTARIO, CANADA

OSBORN

This new modern Foundry of The Cleveland Co-Operative Stove Company, Cleveland, Ohio, is 135 by 1,000 feet long. Some idea of its enormous size and production may be gained from the photograph above, which shows one of the 1,000-foot foundry bays while production is in progress.

This is one of the most modern light grey iron shops and is equipped with modern labor-saving devices, which include over 100 Osborn Moulding Machines. Portable types of machines which follow the sand pile are used exclusively.

The castings produced are of the highest quality and the production speaks for itself as may be seen in the photograph above.

Our sales engineers are experienced in foundry practice and equipment. It is a pleasure for them to study your foundry conditions and advise the proper rigging and equipment that will help you increase your foundry production.

Your copy of our 1920 Condensed Catalog will be mailed on request.

Some Osborn Moulding Machine Advantages:

(1) Insure rapid production
(2) Lower direct moulding costs
(3) Accelerate delivery
(4) Effect saving in metal
(5) Lower overhead per ton
(6) Reduce grinding
(7) Lessen pattern repairs

THE OSBORN MANUFACTURING COMPANY

INCORPORATED

Main Office and Factory

New York — 5401 Hamilton Ave. Cleveland, Ohio — San Francisco

FOREIGN REPRESENTATIVES

Allied Machinery Co. de France, 19 Rue de Rocroy, Paris, France.

J. W. Jackman & Co., Ltd., Caxton House, S.W. 1, London, Eng.

Horne Company, Ltd. 6 Takiyama-Cho, Kyobashi-Ku Tokyo, Japan.

E. Isbecque & Cie. 36 Rue Otlet Brussels, Belgium.

Allied Machinery Co. d'Italia 40 Corso Dante. Torino, Italy

Plain Air Squeezers

Made Regularly in the Following Sizes:

No. 74.....33″ Distance between strain rods
No. 75.....36″ " " " "
No. 76.....40″ " " " "

Sand Straddler Type

No. 74-W.....33″ Distance between strain rods
No. 75-W.....36″

Combination Jolt Stripper Squeezers

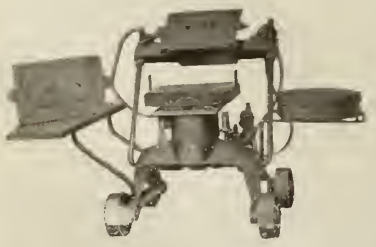
Made Regularly in the Following Sizes:

No. 78.....36″ Distance between strain rods
No. 80.....31″ " " " "
No. 81.....38″ " " " "
No. 82.....45″ " " " "

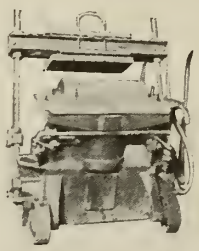
Combination Jolt Squeezers

Made Regularly in the Following Sizes:

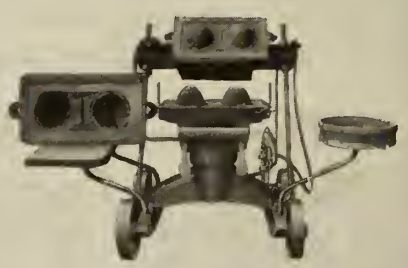
No. 74J.....33″ Distance between strain rods
No. 75J.....36″ " " " "
No. 76J.....40″ " " " "



No. 75W—Sand Straddler Type Osborn Plain Air Squeezer.



No. 78—Osborn Stripping-Plate Jolt Squeezer Machine.



No. 75J—Osborn Jolt Squeezer Machine.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Members of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

Lifting and Conveying Material in the Foundry

How the Modern Foundry Eliminates the Drudgery Which Formerly Held Such Prominence, Not Only in the Shop But Behind the Cupola and in the Yard

By F. H. BELL

HOW the ancient Egyptians raised the enormous blocks of stone which were used in the construction of the Pyramids is a source of wonder to tourists who visit the land of the Pharaohs and gaze upon these vast piles of masonry. How they removed the ponderous granite obelisks one hundred and fifty feet in length and fifteen feet square and weighing many hundred tons from the quarry and transferred them over land for miles and then stood them on end is still a mystery—but, as the ancient fabulist Æsop said of all our desires, "Where there is a will there is a way." The Egyptians wanted those stones moved and erected, so they moved and erected them, and they found ways and means of accomplishing it. When the comparatively small one seven feet square and seventy feet high and weighing two hundred tons was presented by the Khedive of Egypt to the American Government a few years ago, it taxed the ingenuity of modern scientists to devise means of tipping it over on its side, and once this was accomplished another obstacle stared them in the face, viz., transferring it to the water's edge preparatory to shipping it across the Atlantic. Steel rollers crushed under the load like so much chalk and hard bronze had to be substituted; so it will be seen that since history began the subject of lifting and conveying has been one full of perplexing problems, but which have always been overcome.

The matter of lifting and conveying material in the foundry is a big item in foundry work, but up till a comparatively recent date it has not received any more than its share of attention. Heavy work has usually been done in an awkward way on account of insufficient facilities for handiing the work, but while this has been the case it has always been realized that better facilities were in order and would come at the proper time. The matter of handling smaller work and lighter material by any other means than by hand has, however, received scant consideration. Anything which a man or a number of men could handle by hand has, as a rule, been done that way, but as has been frequently pointed out the foundrymen have at last wakened up to the fact that in the foundry as well as in any other business the best is none too good, and as a consequence everything in a modern foundry is handled by a device of some kind suited to the job. The hand-operated jib crane has been in use in the molding shop for many years and is still the only means of lifting heavy loads in some shops, but in most modern shops power driven cranes are used, although the fundamental principles embodied in the hand crane are similar to those in the power crane. With the hand crane with, say, a six-inch drum on which to wind the cable and a two-foot crank, the operator would have a purchase of 8 to 1 if the drum and crank were on the same shaft. If the drum is on another shaft and a gear and pinion used, the power is again increased in proportion to the diameter of the two wheels. If back geared the power is again increased, and if the cable runs through the shrive block and fastens to the further end of the crane, the power is

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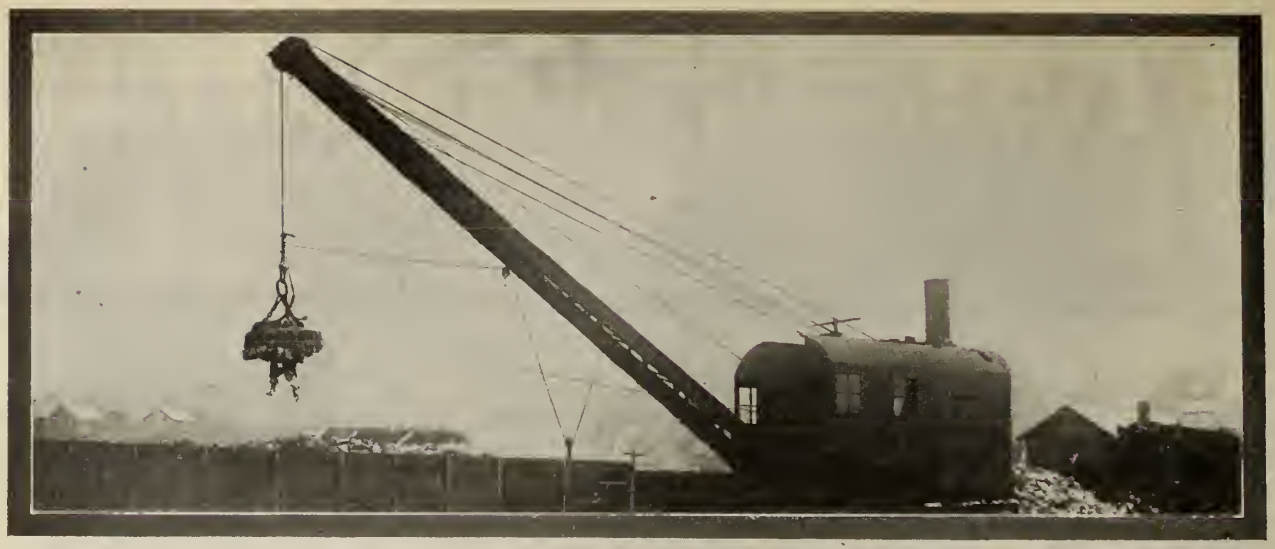


UNLOADING PIG IRON AND SCRAP, ALSO PLACING IRON CHARGES ON STAGING. USING MAGNET IN BOTH CASES.

again doubled, so that even with a hand crane, if properly constructed, one man could lift an enormous load. The drawback to hand operation is that for every increase in power the speed is decreased proportionately, so that a hand crane is notoriously slow. With power driven cranes the same mechanism is used. Before the advent of electricity a steam-engine was sometimes built into the ordinary jib crane, but since electric motors have become so nearly perfected as they are today, electricity has to a great extent supplanted steam, although the steam driven crane had its advantages and is still considered favorably by many foundrymen. Some plants are well equipped with steam power and not electricity, thus making the steam crane most desirable.

The jib crane, once the only crane to be seen, has now to a great extent been superseded by the travelling crane, so that today there is about as big a variety of cranes as of any other unit of equipment. The crane is not only a unit of the inside equipment of the foundry, but is an aid from the beginning of construction of the plant or digging of raw material, right through to the shipping of the finished product.

Many of us are familiar with the seemingly unsurmountable difficulties experienced in shipping the first consignment of iron ore from the Marquette Range, back in 1845. It is difficult for us to imagine how manual labor and "the old gray mare" could have loaded and unloaded the ore carriers of the Great Lakes, so impressed are we with the smooth-working vastness of present-day methods.

The transporting and handling of materials affects the fixing of prices and profits, exercising a decided influence on the firm's expansion. Thus the growth of the steel and iron industry is linked inseparably with the development of material handling machinery. The modern whaleback of the Great Lakes was brought into being solely to supplement the efficiency of the crane.

Industrial cranes are now performing a wide variety of tasks in practically every iron and steel mill in this country and the United States. Their usefulness begins with the raising of the first scoopful of earth from the factory site and never ends.

When the construction of the new mill is undertaken, the purchase of a locomotive crane usually becomes the first consideration, and the various ways in which the crane makes itself useful enables it to pay for itself during the construction period. Equipped with a grab bucket, it begins to excavate; it drives piles; with one sweep of its majestic arm, it delivers the concrete from the mixers to the forms—often covering a delivery radius of 15,000 square feet. In this instance alone it performs the work of fifteen men working with barrows.

With the foundation work completed for the open hearth furnace, the gigantic gas mains, and the coke ovens, the crane becomes an indispensable adjunct unloading and placing heavy, bulky girders and structural steel—a task which it performs with ease and accuracy. The all-around usefulness of an industrial crane is never shown to better advantage than standing amid these monuments of modern industry as they rise, story by story.

HANDLING SAND BY MEANS OF GRAB BUCKET.

When the construction work is over, the tracks which the crane has laid become the scene of its daily activities. Its work now consists of handling carload after carload of incoming raw materials. We have pictured an industrial crane handling pigs with the aid of a magnet. It can do the work of thirty men in a fraction of the time—unloading cars and placing the material at any point within a radius of fifty feet.

In replacing men on jobs of this character, cranes have often solved a vexing labor problem. Workmen find it bad enough to be forced to handle frozen pig and scrap iron in winter, but when the summer sun comes beating down, the men become inefficient and discontented. Many of them leave.

When the crane is not unloading raw material, or loading cars with finished work, a grab bucket may be attached for handling fuel, ashes, sand, etc.

Economical handling of coal in the average plant becomes a question of vital importance in order to compensate for uncertain mine production, railroad embargoes, and possible advances in freight rates. The installation of coal handling machinery involves careful consideration of the individual operation conditions—the volume and grade of coal handled, location of storage piles, etc. The field of activities of an industrial crane is not limited to any one place, as is ordinarily the case with coal conveyors. A complete line of buckets and appliances enables it to provide a proper type of equipment for handling all materials.

There are many concerns today who are fully aware that a locomotive crane could be of great assistance in the performance of their regular routine work, but who have never deemed it advisable to make the investment. Many of these concerns could receive a valuable "tip" from the example of the steel mills.

With expansions and additions taking place or being contemplated in most manufacturing plants today, perhaps this solution of the problem may be feasible:

The manufacturer can easily figure the purchase of a crane as part of the expense of building his new addition or new plant. The crane will largely pay for itself before the construction work is finished; then it will be ready to lend its efficient and economical assistance to routine jobs.

Grab Buckets

A grab bucket is an arrangement which attaches to the crane and is so arranged that it opens like a clamshell and is lowered on to the sand, where it closes and in doing so fills itself with sand, in which condition it is swung to the desired position, where it is opened, allowing the sand to fall out. This is a convenient and rapid way of digging pits, filling large molds or doing any sand handling within its range.

Lifting and Conveying

Grab buckets are made in different types, but all working on much the same principle. Some types have two hoists, one to do the lifting and the other to operate the bucket, while other types are controlled entirely by one hoist. In the illustration will be seen a single hoist type of bucket built by Edgar E. Brosius, of Pittsburgh, Pa., which is said to be doing the work satisfactorily.

The grab bucket, like the crane, can be used for myriads of other purposes than sand handling, such as handling coal, cinders, ashes, sawdust or anything

THE BROSIUS SINGLE HOOK GEAR BUCKET.

which can be enclosed in it, but as a foundry tool it would soon pay its way without the outside work. Take, for instance, the pit which was required for the dynamo base, illustrated in the last issue of Canadian Foundryman. This pit had to be thirty feet in diameter and six feet deep. This was dug with a grab bucket hung on the crane. But supposing there had been no grab bucket, how could this pit have been dug? Gangs of men would have been employed to bring the sand from the centre and pitch it over the side, when other men would wheel it out of the way. With the grab bucket, the crane drops it down on the floor and in lifting it up again it grabs about a wagon load of sand. When high enough to clear all obstructions it is taken to any unused spot and deposited until again required. Where much pit work is done there is no more useful tool than the grab bucket. The same tool is used to fill the pit when the casting is taken out. Large molds which are rammed on the floor in flasks are filled in the same way.

The Magnet

The magnet spoken of and illustrated in the industrial crane view is connected with an electric generator. It can be lowered down on to a pile of pig or scrap iron and the current turned on which magnetises it. When lifted, it brings an enormous lot of iron with it. The crane is then swung to the proper position and the current turned off, when the iron will immediately be released and will fall to the charging platform or wherever required. This is a grand arrangement for unloading boiler plate out of the car. Anyone who ever had experience in getting flat plates out of a coal car, such as they are frequently shipped in, will appreciate how convenient the magnet would be. I have seen as many as ten men trying to get a plate into shape to take hold of it and then have about all they could do to lift it over the side of the car. The magnet and crane would save all of this trouble.

Conveyors

In modern foundry practice it is quite common to have a basement under the foundry floor and have grates in the floor through which the sand falls after being used. Here it is supplied with its quota of new sand, tempered and mixed by means of power driven sand mixers and conveyed to another floor above the foundry by means of power-driven conveyors, whence it is delivered to the molders through chutes. Conveyors are also used for conveying cores from the core makers to the ovens, through the drying process in the oven and to the core department in the foundry. This type of conveyor is frequently made of link belts.

Sand Conveyors

In the article on soil pipe in February issue mention was made of underground machinery for preparing the sand before conveying it to the upper story where it will be delivered through chutes to the molders. The following illustrations will give an idea of how this is done. Large foundries would, of course, be built different from smaller ones. An ideal foundry would be three stories high and would have the sand prepared in the basement, after which it would be conveyed to the third story, where it would be distributed and delivered to the molders through chutes.

Old Idea as Good as New

An idea does not need to be new to be valuable. Here is an old one that is essential: "When you put your sand overhead—up in the air—you have it off the floor." Floor space is valuable. The less of it you take up with sand, the more men you can get in your foundry and the more castings you can get

out. Also when you want sand it is right up above. You just let it drop down, and you know how much easier it is to drop sand than to lift it. Besides, your foundry is not cluttered with sand, your men and your trucks can pass straight through. There are no piles to dodge.

"How," you ask, "do you get the sand up in the air?" That is easy. Just see how it is done. A simple elevator or a simple conveyor puts the sand up in the hoppers easier and cheaper than men could distribute it. Carrying and lifting sand are jobs for machines. Conveyors and elevators carry quicker, cheaper and better than men could possibly do it.

VIEW OF PORTION OF FOUNDRY SHOWING OVERHEAD STORAGE HOPPERS AND CHUTES FOR SAND.

As a rule, three types of machines will take care of foundry requirements. If your foundry is a small one, a simple elevator will do all your work. If it is large, a combination of elevators and conveyors will be necessary. For vertical lifts the centrifugal discharge bucket elevator cannot be beaten. For inclined or horizontal runs, belt conveyors are best. For distributing tempered sand, no conveyor is quite equal to a flat belt conveyor with stationary plows. For handling knock-out sand, steel apron conveyors are most satisfactory.

Cheaper and Better

Whenever duplicate work is cast, the use of continuous mechanical sand handling equipment will cut operating costs and increase production.

Consider a typical continuous system. The molds are shaken out over one or more gratings. The castings remain on top and are carried away by means of the overhead trolley for cleaning. The sand goes through and into a hopper, from which it is delivered to a screen. Here the burnt sand, the sprues, the gaggers and other foreign material are taken out and new sand is added and thoroughly mixed. Next the sand passes into a simple machine which cuts, aerates and tempers it. Then it goes into a bin for equalizing and finally it is distributed to overhead hoppers in proper condition for molding. Once the sand has passed through the knock-out grating, it is not again touched by human hands until the molder gets it.

Equipment of this sort saves floor space because the tempered sand is stored overhead and the used sand is removed as soon as it is knocked out. Labor is eliminated because there is no hand shoveling, screening, tempering or carrying. Production is increased because the molder is able to devote his entire time to actual molding. Further, there is no need for night gangs for tempering and cutting sand. The equipment prepares the sand continuously as it is knocked from the flasks. The sand is all ready for the next shift two or three minutes after the last mold is dumped.

CENTRIFUGAL DISCHARGE BUCKET ELEVATOR.

Hand Riddling Out of Date

Hand screening of sand is disappearing fast, and no one is sorry. Operators are not sorry because mechanical screens are cheaper and better. Men are not sorry because they are not asked to do that back-breaking work. Never let a man screen or mix sand. If you do you waste human effort and your own money. Progressive molding and casting presents the same advantages as progressive assembling of automobiles or progressive work of any other kind. The line of continuous conveyors here described are manufactured by the

BELT CONVEYOR FOR DISTRIBUTING TEMPERED SAND.

C. O. Bartlett & Snow Co., of Cleveland, Ohio.

Transporting Materials

From the Bulletin of the Foundry Equipment Manufacturers' Association we take the following:

Under our present industrial conditions, high cost of labor and extremely high labor turnover, foundry executives will find it worth their while to make a serious study of their material handling and transportation problems. The development of industrial transportation equipment has been of comparatively recent growth and only a relatively small number of industrial executives have taken occasion to study its application to their particular problems. The size of a plant and the existing conditions will determine the type of equipment most appropriate.

CONVEYOR UNDER FOUNDRY FLOOR FOR CARRYING KNOCK-OUT SAND.

Many applications will suggest themselves to the ingenious owner of a self-propelled truck, the list herein suggested is only a general outline of some of the more obvious uses to which it is adapted.

(A) Handling Raw Materials: Sand; coke; limestone; pig iron and scrap.

(B) Materials in Progress: Cores; supplies to coremakers and molders; flasks to and from storage; patterns to and from storage; molten metal.

(C) Finished Product: Castings from floor to cleaning department; from cleaning room to shipping department; from shipping department to cars.

(D) Reclaimed Material: Gates; scrap and defective castings.

(E) Waste Material: Cupola drop to dump; burnt sand and sand blast refuse to dump.

The cost of handling sand stored in an overhead bin and loaded in a V-dump body erected on one of these trucks is surprisingly low. Even if the sand is loaded by hand on to the same style truck a material labor saving over the usual wheelbarrow method would be effected. The usual capacity of one of these trucks is 1½ yards of sand or approximately 15 barrow loads.

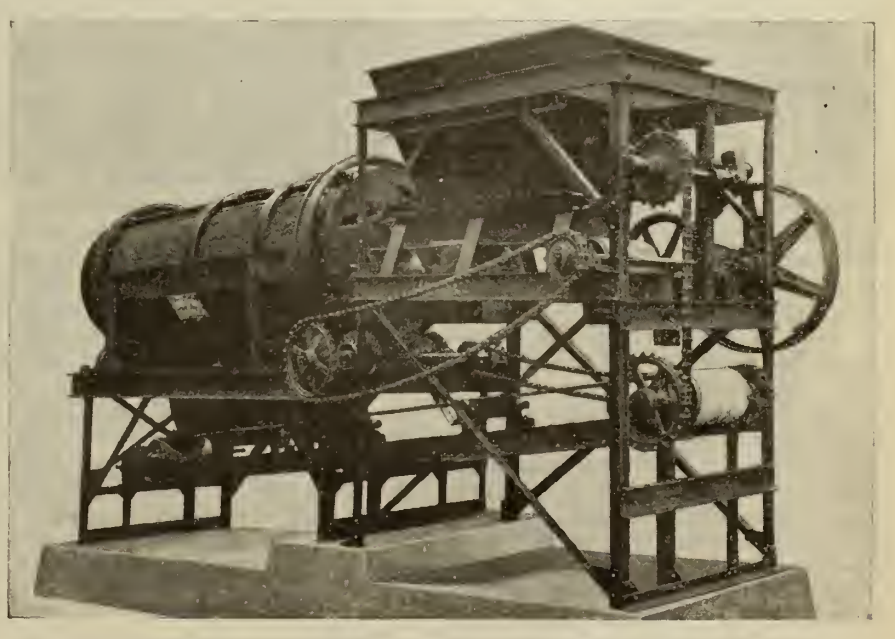
Foundries in which the amount of sand handled is not sufficient to keep a unit of this kind busy could profitably find employment for a lift truck with V-dump skids. After the truck delivers sand it can be used elsewhere either as a flat burden bearing truck or in conjunction with skid platforms.

Pig iron and scrap are loaded into box skids by magnet or other available means and transported by lift truck to the cupola charging platform where the material can be charged mechanically if necessary. Aside from the labor saving feature this system of loading and transporting the cupola charge eliminates to a great extent the hazard to hands and feet when the same work is done by hand labor.

Coke and limestone are handled in the same manner as pig iron with the exception that larger boxes are necessary. The trucks are built to carry a given weight and it is advisable to load them to capacity.

Lift trucks can be used to advantage in the core room. The work benches can be arranged to better advantage because the distance from the oven makes no material difference. Racks for loading the cores may be left at any convenient point and when they are loaded can be picked up by the truck and conveyed into the oven. After the cores are dried they are taken out of the oven by the same truck and either carried to the stock room or taken directly into the foundry for the molder's use. It never should be necessary for the molders or coremakers to go to the store room for supplies. Arrangements easily can be made for delivering all store room supplies by a battery storage or other type of truck. This will eliminate wasted time and extra labor.

The interior of a foundry should not be used, as is too often the case, as a storage place for flasks and bottom boards. Capital invested in a foundry is invested for the purpose of producing a marketable commodity. The percentage of return on the investment is in proportion to the percentage of capacity employed for productive work. When flasks are carried to and from the yard or storage by hand or by wheelbarrow the labor cost is high. With a tier lift truck these flasks and boards may be handled on skids and piled as high as desired with a corresponding reduction in the labor cost and an increase in the available yard space. This idea might be carried still further. Skid loads could be tiered so that any part of the pile could be withdrawn without disturbing the loads on other shelves; and brought into the foundry without any re-



SAND SCREENING UNIT BUILT TO GO UNDER FOUNDRY FLOOR. PART OF A COMPLETE CONTINUOUS SAND HANDLING EQUIPMENT.

handling. This, of course, would only apply where they could be required at frequent intervals; otherwise a large supply of skids would be tied up.

Patterns may be handled in the same manner as flasks. Instead of allowing a large number of patterns to accumulate in the foundry a regular schedule can be made out whereby a truck that has been engaged in other work all day can make one or more trips between the pattern storage and foundry the last thing in the afternoon.

With reasonably good floors and aisles, self-propelled trucks are steadily coming into favor for carrying hot metal from the cupola to the different floors. Ladles of from ½ to 1½ tons capacity are erected on skids provided with rollers so that if necessary they can be pushed around by hand. The lift truck is employed to pick up both skid frame and ladle and carry it to any designated point. The metal is distributed in hand ladles.

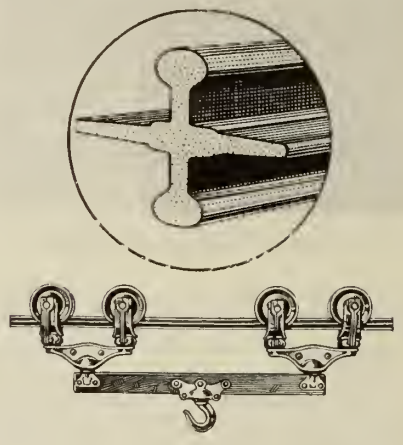
After the molds have been dumped the castings can be loaded in metal boxes or on iron bodied trailers. Where the volume of work warrants it a number of trailers will prove an economical factor. A much greater volume of material can be moved in a given time because the tractor can pull from five to ten times the tonnage of a lift truck.

Castings should be routed from the casting floor to the car in which they are shipped in as straight a line and with as few rehandlings as possible. Lift trucks and skids meet these conditions admirably. By keeping the castings on skids or on trucks they are handy for grinding or for any other operation and when finished can be conveyed to the shipping department without rehandling. If a tier lift truck is used the skid loads can be piled selectively in the shipping department or in the car. The entire load or any part of it can be taken up at one time.

Overhead Trolleys

There is probably no class of conveying equipment which is used to better advantage than the overhead trolley. With this type of conveyor the track covers practically every part of the plant; castings are transferred hither and thither until they reach their destination; sand, cores, flasks, patterns and innumerable other things may be delivered by this means; but one of its most useful features is its ability to take the load off the men in transferring the melted metal to the molders' floors at pouring-off time. No foundry, however small it may be, is considered complete these days unless equipped with overhead conveyor track. In large foundries doing small and medium work it is indispensable, while in small foundries it can be utilized in the place of a crane, and if occasion arises in any foundry it can be used as an auxiliary to assist the regular crane. With the aid of the differential pulley block, commonly known as the tackle block, a real complete lifting and conveying outfit is accomplished for a shop which is not extensive enough to afford all the different units which go to make up a larger plant equipment. The pulley block just referred to is one of the old reliables around a foundry. As an emergency device it has no superior, and as an all-round convenience it excels in many ways.

As pointed out in our last issue the overhead trolley system fills a gap which no other equipment can fill. In the illustration will be seen the design of track manufactured by the Louden Machinery Co. of Canada, Ltd., Guelph, Ont. As will be seen, it is double reinforced. These tracks are arranged with switches which will admit the trolley, also shown in illustration, to be transferred from one track to another without risk of jumping the track. No foundry should be without a trolley track. In pouring



OVERHEAD TROLLEY, SHOWING END VIEW OF TRACK.

off it depends on the size of the shop how it is best to have a tilting spout to the cupola so that the iron will run to one side after leaving the furnace, and when the ladle is filled the spout will be tilted to the opposite side. When this method is to be followed two separate tracks will run to the furnace. These tracks will run away from the spout as far as the gangway, when they will turn in opposite directions. They will, however, be connected at the two turns so that any ladle can be run on to any track. When the ladle is being filled an empty one is always in waiting on the opposite side. When the ladle is full enough the spout is tipped the other way and the full ladle removed. An empty is usually held on the short line connecting the two systems. When the full ladle is shoved on to the main line the empty is switched into place at the spout to await its turn. Where a trolley system is installed the molders do not leave their floor, but simply leave their ladle in the gangway to be filled when the trolley ladle comes along.

Other Uses

Handling the molten metal is not by any means the only use to which the trolley is put. When the heat is over the ladles are removed and platforms put in their places. The castings after being shook out of the molds are pitched on to these platforms and shoved out to the mill room. In filling the rumblers (or tumbling mills as one of our readers insists) this system has advantages, inasmuch as it is possible to load on just such pieces of castings as will allow the mills to be filled in the desired order.

When the castings are properly cleaned they are taken from the mills and replaced on the trolley platform and taken to the grinding machines or to the machine shop or wherever required. For transferring patterns, flasks, bottom boards or any other material within their capacity they are particularly well adapted.

Trucks and Barrows

While studying the new and improved methods of conveying material there are places where nothing has any advantage over the old reliable wheelbarrow and there are still other places where the up-to-date factory truck still holds its own. Like the omnibus and the automobile, which can go where the railway train and the trolley car cannot go, so likewise the barrow and truck can go where nothing else can. The barrow and truck, like all other equipment, are keeping pace in the march of progress and when a purchaser decides that these are the things he wants he does not have to depend on the back-breaking kind of affairs which used to adorn the foundry. Whatever device is found to be required, be sure and get the one which is most suited for the work. In describing the locomotive cranes, the magnets, the sand conveyors, etc., we illustrate them in order that the foundryman will the more easily understand them. The regular foundry cranes and elevators are so well known as far as outside appearance is concerned that it is not necessary to show them here. In the next issue we will see how electricity is attached to cranes, elevators, door openers, etc., as well as how to melt metal, with electricity as the fuel. In fact we will show the different uses to which electricity can be put in the foundry.

McLain's System, Inc., Milwaukee, Wis., have just issued a neat circular, showing photo of group who participated in the second meeting of the McLain's System Alumni, Columbus, Ohio, October 6, 1920. These men range in age from 22 to 68 years, and a brighter, more ambitious looking body of men would be difficult to find. The slogan which heads the story and which accompanies the photo is "Why not be one of us before next convention?" The question remains for the reader to answer.

A Foundry With a Capacity of Five Molders

Built of Concrete Blocks, With Cement Floors, and All Conveniences of a Large Plant

IN the last issue of Canadian Foundryman I answered a question which had been asked on this subject. A subscriber wished to build a foundry capable of accommodating five molders and he wanted my assistance in arriving at a proper lay-out. He did not give me any information about what the conditions are under which he is working. He may be adding a foundry to an established machine shop. However, I gave him what I concluded was the proper information, but I received a second request asking for plans, and the illustrations here shown are what I have prepared.—Editor.

I might say that I am an advocate of the small foundry. I do not oppose the large one, but I can not agree with the argument that the small one can not compete with the large one. I know that there is a limit to the class of work which can be profitably turned out, as well as to the quantity, but for jobbing work which comes within its capacity and for numerous specialties it has all the advantages which a large shop has. Presuming that the foundry is not connected to any other plant the drawing here shown will be a fairly complete unit in itself. In front of the cupola is the crane floor and pit, if such is required. The crane may be a jib crane, which covers the pit, or it may be a travelling crane from the spout to the opposite wall, or it may be a travelling crane running lengthwise of the shop. On the side next to the yard should be done, so as to be handy to the flask pile. On the two floors at the other end would be the snap benches or machines. The cupola is always better to be in the shop, but placed as it is without any wall in front of it makes it equally as convenient, and it is out of the way. In a room next to the cupola is a good place to have the core oven, and if so desired the cupola chimney can be utilized for the oven. The oven should open into the foundry as well as into the core room. The mill and grinding room could be on the opposite side of the cupola from the core room.

The front room makes a nice office and the back one does for pattern and flask work and some patterns can be stored temporarily in this room.

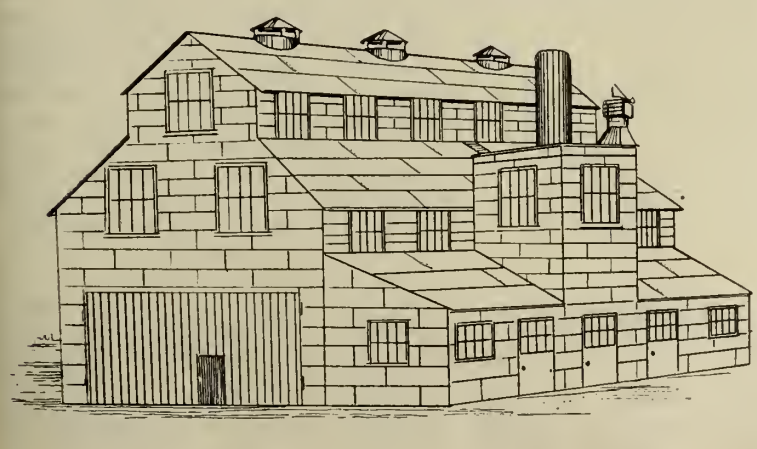
The ventilating is without doubt one of the most important things to be considered. The questioner specified that he would build with concrete blocks and I have shown the building constructed of this material. I am also favorable to the concrete floor and pit. The ventilator shown on the cupola room is one which turns with the wind and is always in the proper position. The ones on the top are stationary and have a damper, which is turned to close them. The power can be supplied by electric motor or gasoline engine, which can be on the charging floor, or it may be supplied by steam engine or waterwheel, which would, of course, require out-buildings.

As I have pointed out on former occasions, a shop of this size, if used to its capacity, can turn out a lot of castings at as reasonable a price as could be done in a large shop. Five molders can fill this shop in as short time as would be required to fill the same space in a large shop and at the same expense.

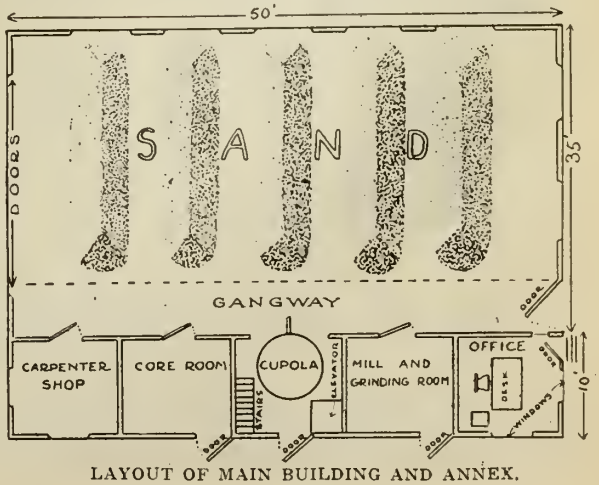
This plan, however, is just a general design which can be modified to suit the occasion. If the foundry is in connection with the machine shop it might not be necessary to have an office. There is a wood working department in connection with other parts of the plant, it would not require one in the foundry. The core room and the mill room can not very well be located anywhere else, and if the office and carpenter rooms are not required this space can be used for castings and for temporary storage of patterns. There are many things which are considered essential in a large plant, but which are usually neglected in the smaller shops and this is why a small shop cannot always compete with the large one. For instance, it is just as important to take off a heat every day in the small shop as it is in the large one. A shop taking off three heats per week is only doing half the business which could be done in that same shop if six heats were taken off and the overhead costs are the same in both cases. Heating the shop is a small item when casting every day. Of course, it is not necessary to have the shop quite as small as this one. Any sized shop can be made to pay if everything is built in proportion and operated accordingly. Don't have a lot of equipment standing idle. Everything which costs money should be kept in constant use in order to yield returns. In constructing a small foundry there is not very much to worry about, but if about to erect a foundry of any size I would strongly recommend engaging a regular foundry engineer to advise the best means of arriving at a design which will suit the location as well as the class of work to be done. The class of foundries being built during the last few years are so far in advance of the old fashioned dungeons that no foundryman can afford to take the risk of not being right up to date.

CAUSES OF CORROSION

"To my mind," said Dr. O. F. Hudson, of the Admiralty research laboratory, at a recent meeting of the Society of Chemical Industry, in Birmingham, "electrochemical is not the sole cause of corrosion in the case of copper and brass, and that in most cases, in neutral or slightly alkaline solutions, that action was relatively unimportant, the greater part of corrosive attack in these cases being due to direct chemical action. In acid liquids, and industrial waters which had a distinctly acid reaction, electrochemical action might play a more important part, but in such cases the metal, e.g., condenser tubes, failed by general thinning rather than by pitting or localized attack, which was in other cases generally the chief trouble."



AN IDEAL FOUNDRY WITH CAPACITY FOR FIVE MOLDERS.



LAYOUT OF MAIN BUILDING AND ANNEX.

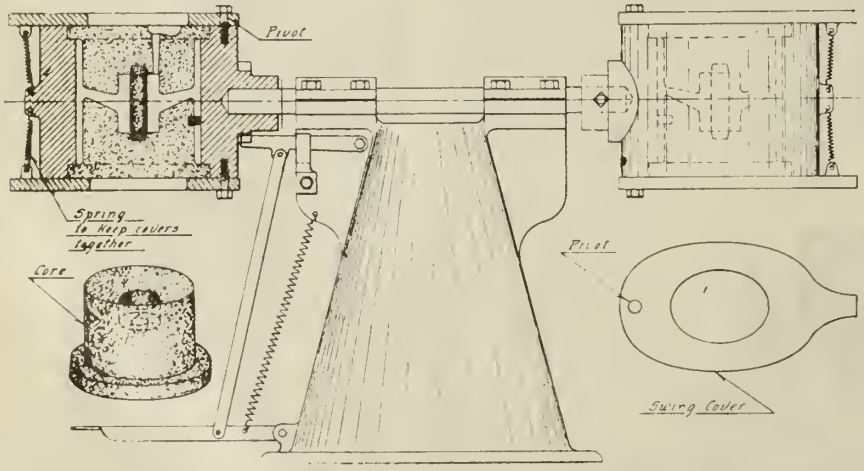
Casting Pulley in Iron Mold With Cores Inside

After Pouring, the Operator Opens the Cover, Dumps the Castings Out, Places Another Set of Cores, and Closes Up Ready for the Next One

By G. O. VAIR

AN ingenious device and one which has given the best of satisfaction on the work for which it is intended is the pulley casting machine shown in the illustration. The machine, as will be seen, is double, or in other words is two machines on one pedestal. The mold consists of a cast iron pipe bored to the diameter of the outside of the pulley and four or five inches thick. This is in reality a chill and works the same as the chill used in making car wheels. It requires to be slightly longer than the pulley, and is counterbored at each end, leaving the exact length of the pulley between the counterbores. The inside of the pulley is made with cores similar to those shown in illustration. The flange on the core fits into the counterbore in the chill, which holds it in its place, while the shoulder at the flange makes the end of the pulley. At the end is a swinging cover which pivots at one side and when swung shut is held firm by attaching it to the coil spring shown on the opposite side. After placing one core the cover is swung shut and secured, when the mold will be turned reverse side up; the centre core "set" and the remaining core for forming the inside put in place. This latter one will contain the pouring gate. Both ends of the mold are wide open with the exception of the little bit which is held by the cover, this providing every chance for the escape of gas from the core. In order to allow of using set screw in the hub, a small core is pasted onto the main core at the proper place to puncture the rim, so that the drill can be inserted. It would be quite possible to make arms on the pulley but it would require care in placing the cores and in addition would not make a first class pulley, as the rim being cooled so rapidly would leave the arms in a fluid state and liable to pull away from the rim. By leaving a web between the two cores a more even thickness is secured. This web may have openings through it by having the cores to touch at certain spots, and by having the web to dish as shown it will yield as the rim contracts and will likewise come back into place when its time comes to contract. The advantages to be gained in this way of casting pulleys are that the rim is almost perfect when it comes from the mold; dozens can be made for the price of molding one, once the machine is installed, less risk of failure, and in fact practically everything is in its favor. At casting time the machine is put in readiness and one man pours while another man dumps the castings out and cores up ready for another by the time the pourer returns with another ladle of iron. By this means a great number of pulleys can be made at a heat from one machine. The main thing is to keep the chill perfectly clean and it is advisable to pour at least one each day, even though no orders are urgent and by this means keep the chill from corroding.

In making the core for the upper half of the inside, it is advisable to run some vent holes through, in line with the edge of the pulley to carry away any gas which forms in the mold. Putting dope of any kind on the chill is not to be recommended as it only makes extra gas and also streaks the face of the casting. If the chill has an occasional coal oil wash and is always kept clean the pulleys will take a beautiful polish. An arrangement of this kind would of course, only be of service where a large number of pulleys are required, but the same idea can be utilized without the machine if the expense required to build the machine is not justifiable.



PULLEY CASTING MACHINE. NO MOLDING WHATEVER. THE PERMANENT IRON MOLD FORMS THE OUTSIDE WHILE TWO CORES SIMILAR TO THE ONE SHOWN TO THE LEFT MAKE THE INSIDE.

The Flexible Shaft Co., Ltd., Toronto, has been incorporated with a capital stock of $40,000 by Richard W. Hart, 67 Yonge street; Charles H. C. Leggott, 116 Arundel Avenue; Lewis A. McHugh and others, to manufacture power transmission machinery and appliances, tools, etc.

Quick Repair Work—Sweeping A Grinder Base

Using the Sweep and Spindle, With the Aid of a Few Loose Pieces of Wood, in Making a Machine Base in Repairing a Break-down

By J. W. TAYLOR

THE disc grinder base shown at Fig. 1 was broken beyond repair, fortunately without injury to anyone, putting an important department out of commission until replaced. By the method hereafter described, a new base casting was made in fifteen hours after the accident, the cost of a pattern being saved, five hours time in the pattern shop, and ten hours molding cost, being the principal outlay outside the cost of lumber and other pattern-makers' materials.

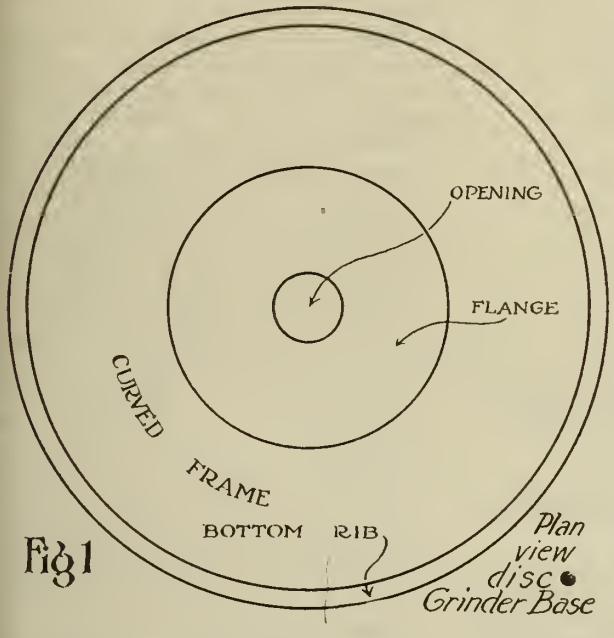


Fig 1

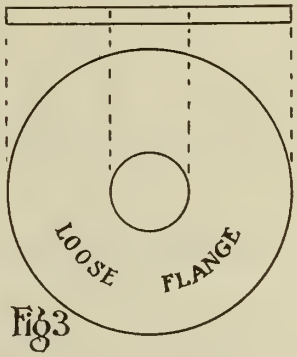


Fig 3

The view of the mold at Fig. 2 is self-explanatory, a spindle plate being bedded in the floor, the shaft being next plumbed straight, and the sweep bolted to place exactly at right angles to the spindle, in accordance with good foundry practice.

The core was swept up, plus a thickness of sand equal to the outside diameter of the casting, the necessary contraction being also allowed for, this face being lined up with wet pasting sand for obvious purposes. The strickle was now removed, and the loose flange, Fig. 3, also shown in Figs. 1 and 2, set to position, after which the two pulley check parts used as a flask were lowered to place, and rammed up carefully to the upper face of the loose flange above mentioned.

To accommodate the cover core used as a cope, a perfectly flat face was strickled around the flange before its withdrawal, the box being next hoisted off and placed on blocks to permit the necessary finishing.

The spindle was again replaced, with strickle again bolted to its position, minus the two loose pieces shown in Fig. 2, the one-inch drop and one-inch decrease in radius allowing the extra core size to be swept off, thus leaving the core to its correct diameter. Plumbago blacking was well rubbed on both core and outside mold before closing. A cover core made from the open frame box at Fig. 4 being perforated with the necessary holes intended to serve as runner and riser, and set to place over the flange mold.

A pair of short rails were laid across and wedged where necessary; the runner and riser boxes made up; the piece now being ready for pouring.

A twenty per cent. semi-steel mixture was used, great strength in a casting of this type being of primary importance, high manganese, fairly high sulphur, low phosphorus, and as low a silicon content as compatible with machining facilities being employed.

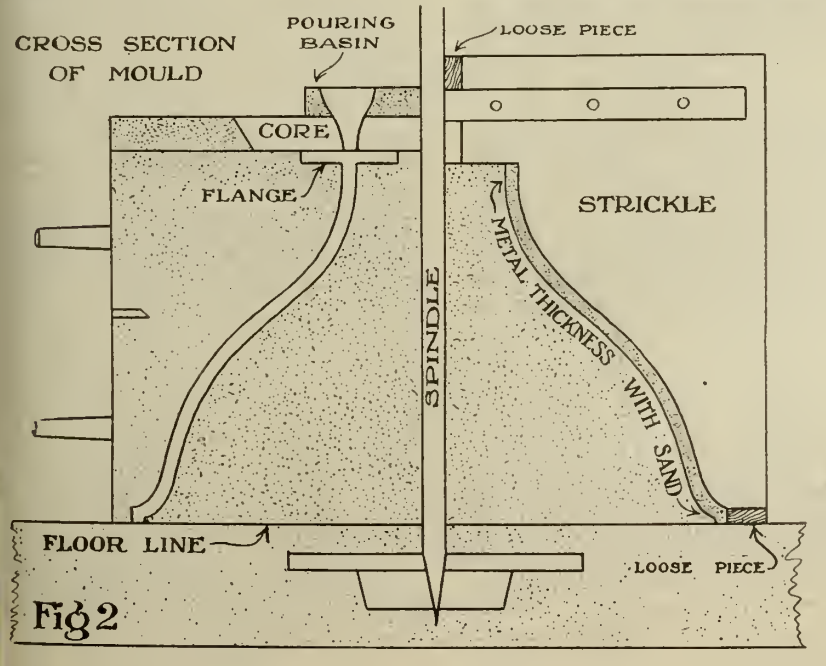


Fig 2

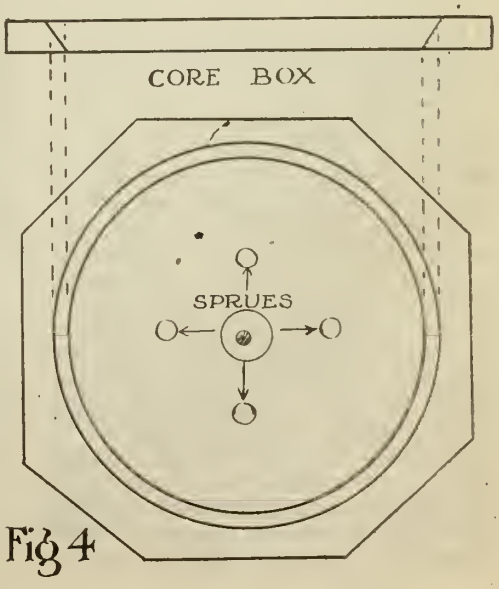


Fig 4

Sweeping an Interesting Green Sand Job

Showing How a Two-Part Bending Rool Was Made on Short Notice Without the Expense of a Pattern

By J. H. EASTHAM

THE two half bending rings shown at Fig. 1 were required at short notice for use in the boiler making department, a perfect circle after the joints were machined being necessary. To avoid the cost of a half pattern six feet in diameter, as well as to save time, the foundry, after a brief consultation with the pattern shop, decided to sweep the two castings out in a green sand mold at one time. To strickle out a plain circular mold, split by thin cores or plates, would have made this an easy matter, had circumstances permitted, but the necessity of a full half circle, plus machining, in each case, gave food for thought. An outside and inside section corebox could have been made, a bed swept up, and the two pieces assembled

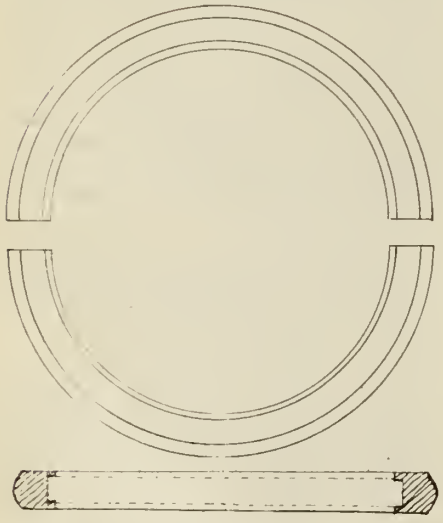


FIG. 1—VIEW FOR CASTINGS FOR BENDING RING.

on it in core, or a mold made in loam, or in sand from a full pattern, room for endless argument and unnecessary cost.

It has been said that if a man were cast on a desert island, without hope or prospect of ever escaping, in company with two women, one a brunette, the other a blonde, he would marry the brunette and spend the rest of his days looking speculatively over his shoulder at her of the auburn locks. Perhaps so. Most of the molders of my acquaintance, in like circumstances, would take a chance both ways, regardless of the law of bigamy. And, mark well, this is not written by way of slandering the craft, but as a tribute to their courage.

I perceive we have devoted sufficient space to the advocacy of polygamy, so will continue our original story. A three armed spindle socket, made to accommodate two spindles instead of one, was made, as indicated at Fig. 2, the metal being chilled round the tapered ends of the shafts in the usual way.

The casting, when cleaned, was buried at the usual depth in the foundry floor,

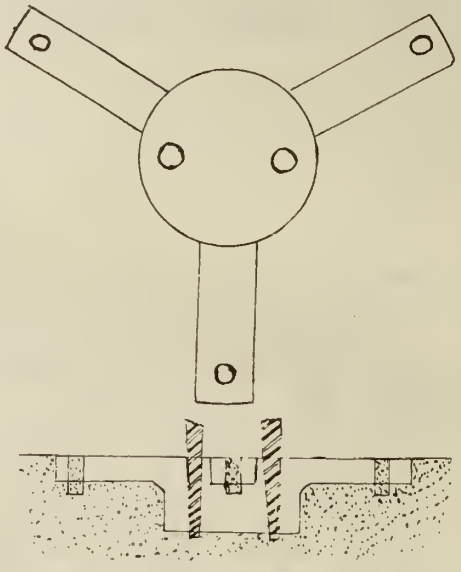


FIG. 2—THREE ARMED SPINDLE SOCKET. NOTE TWO-SPINDLE SEATS BEING CAST TAPERED CHILLS.

a sweep board bolted to place at the prospective parting level, and a hard bed struck off, of a little larger area than the casting's diameter, twin marks outlining the pair of half rings being shown on the joint. A cope part of size sufficient to cover both castings was next rammed up over the bed, gates and rises being placed where needed, the cope being then removed, and a circular pit opened large enough to accommodate the pattern sweep board shown at Fig. 3, one half ring being struck up in one spindle socket, the other in its companion, the mold at this stage being clearly shown in the sketch. A section of the pattern, Fig. 4, was passed round after the sweep, to facilitate truing up the joint and repairing broken edges, and in this connection arose a diversity of opinion. Obviously, a solid pattern piece, after being passed round, could not be removed from a plain mold of convex design. A drawback plate of slightly greater length than the pattern section was used in each half, plenty of outward taper being allowed to prevent ragging when being drawn away, or crushing when being replaced, one of these being shown, as well as the inside cores forming the groove, in the view of the drag mold at Fig. 5.

Now, as to the difference of opinion above mentioned. Some of the wise ones said a dovetailed pattern, Fig. 4 again, please, would have saved the use of drawback plates, and so it would, the concave or inside piece could have been drawn up first, then the convex or outside piece drawn in till clear of the mold, and afterwards drawn up. But what of the cost of the dovetailing, as compared with using two core plates, following, of course, the usual profanity in the core room before they let us use them, added to half an hour's additional labor in making the partings?

The space between the ends of each mold, equal to the distance between the centers of the two spindles, was cut away approximately to shape, and filled in afterwards by means of two pieces of core filed from stock, contraction and three-eighths of an inch stock at each of the four joints of the castings being duly allowed. A dry, blacking finish, well rubbed in, and afterwards sprayed with molasses water, was employed, skin dry-

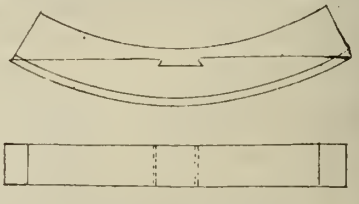


FIG. 4—SEGMENT OF RING PATTERN. DOVETAILING OPTIONAL.

ing by means of an oil burner being considered sufficient, in view of the fact that the mold was neither deep nor complicated.

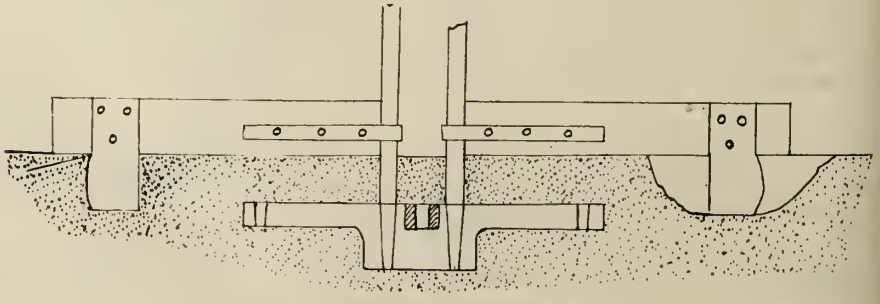


FIG. 3—SWEEPING UP DRAG MOULD.

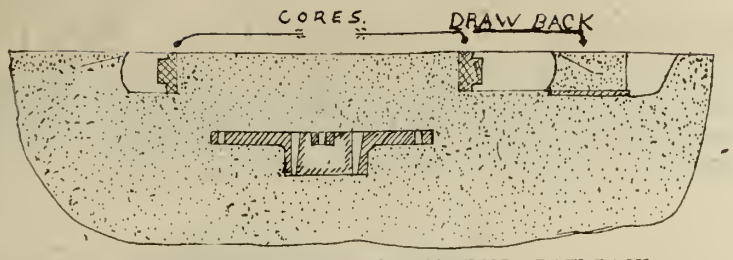


FIG. 5—SECTION OF DRAG MOLD SHOWING DRAW BACK.

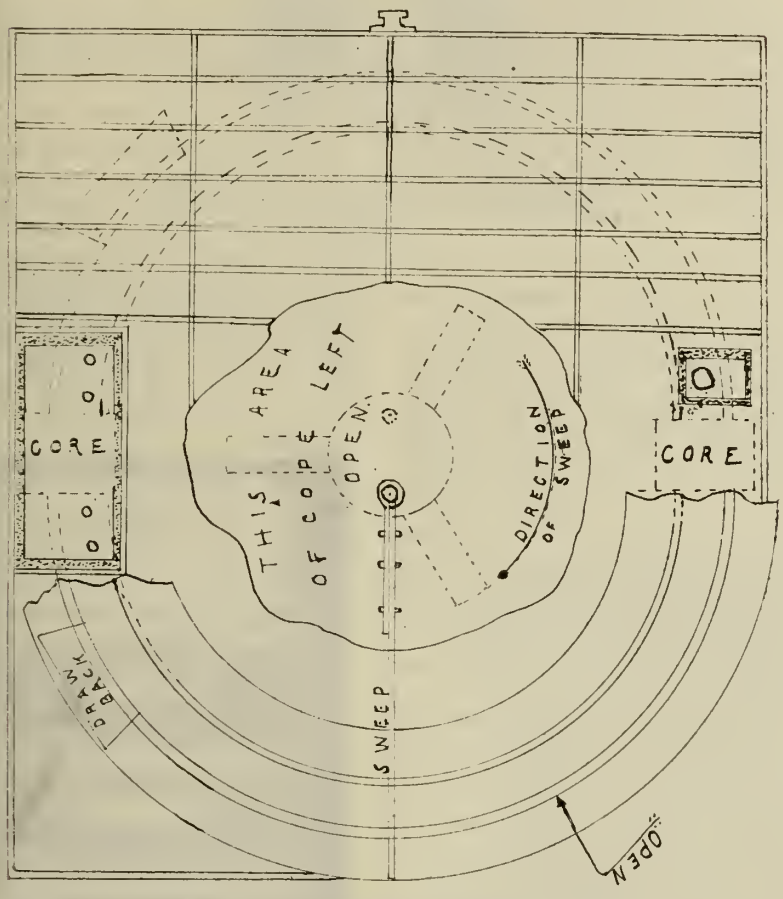


FIG. 6—COMPOSITE PLAN REVIEW OF MOLD.

As shown by Fig. 6, two "pop" gates were used on each casting, all placed in a single runner box, heavy risers being placed at intervals and churning to avoid undue local shrinkage resorted to.

The segment cores forming the square groove on the inside of the circle were made in a plain frame (box, Fig. 7) reinforced by a rollover frame, the use of flat-core plates being thereby made possible, and the need for driers eliminated.

Great strength in castings of this type being of primary importance, a 30 per cent. semi-steel mixture was used, two tons of metal being tapped into a single ladle at the beginning of the heat, to insure correct timing and the best results, the castings when analyzed showing the following composition: Silicon 1.30, phosphorus .30, manganese .95, sulphur .09.

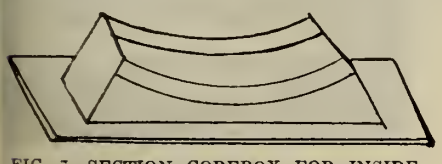


FIG. 7—SECTION COREBOX FOR INSIDE GROOVE.

HOW TO OPERATE A SANDBLAST

The supply of air must be ample and steady at the pressure specified by the maker. A compressor large enough to maintain the desired volume and pressure is necessary. The air must be dry; any moisture in it will condense on the inner surface of the sand tank, flow down the sides and dampen the sand valve and prevent the sand from flowing. When this happens, clean out the damp sand and replace it with dry. A water separator in the inlet pipe to the sand blast will prevent this trouble. The separator is made in standard form by the manufacturers but can be made locally out of a steel tank or large pipe through which the air can be passed on its way to the sand blast hose. A drip cock at the lowest point, if opened regularly, will drain off the condensed water.

Sand that can be obtained locally will answer the purpose if it is clean and free from dirt and clay. The grades may vary from pebbles to fine particles, depending upon the class of work which has to be cleaned and also on the size of the nozzle used. A grade of sand that will pass through a 30 to 50-mesh screen will clean castings thoroughly, it is easy to use and the grains do not break up as appreciably as the coarser varieties. Steel shot or fractured steel may often be used to advantage when suitable means for collecting and returning the material to the storage tank are available. Dampness is fatal to crushed steel or shot, causing it to rust either in storage or in the sand hopper. No matter what kind of abrasive is used it must be bone dry or it will cake and form pellets that clog the nozzle. To insure a supply of dry sand all the time a proper sand drying stove should be provided in which the sand dries slowly and flows out at the bottom when dried. If a stove is not available the sand can be dried on a flat plate held over an open fire and stirred continuously. It will dry suddenly and should be removed at once to prevent burning. Sand will not absorb moisture to any appreciable degree and can be used a long time after drying if it is stored in bins indoors where it will be protected from the weather. When sand is warm it flows much easier than when it is cold.

Dust from the burned sand on castings or from the breaking of the cleaning sand, is removed by an exhaust fan of sufficient capacity to furnish the necessary suction at a moderate speed. A fan larger than the actual requirements and running slowly, will last longer than the one just the size needed, which must be pushed to its maximum speed. The finer particles of dust and sand are removed from the air either by a dust arrester comprised of an air-tight steel structure containing a series of vertical cloth-covered screens which are rapped at intervals by mechanical hammers to throw the dust down into hoppers or by an arrester of the cyclone type which acts on the centrifugal principle.

Some of this sand is used for parting sand but the most of it is regarded as useless and hauled to the dump. All joints on the dust arrester should be kept tight and the surfaces exposed to the weather should be painted frequently.

The dust piping must be of sheet steel, of sizes recommended by the makers. Short, abrupt bends are not permissible and the pipes must be air-tight whether the dust is carried through them by suction or pressure.

Keep all working parts in good repair, replacing any that show sign of wear before they actually give out. Arrange the refillings so that the sand tank is emptied at the end of the day's work,

Continued on page 37

Uses to Which Malleable Castings Can be Put

Completely Annealing Heavy Sections—Interior Contains Slightly More Carbon Than the Surface—Different Tests on Castings of Various Descriptions—Malleable Iron Resists Rust

WITH the understanding that we are limiting this discussion to the members of the iron and steel family, we may say, broadly, that the engineer in selecting a material for any given purpose must ask himself five questions.

1. Is the material suitable, or, in other words, will it stand up under the work demanded and at the same time lend itself to the design required without overburdening the structure with unnecessary weight? Will it also stand repeated shocks, vibrations and fatigue?

2. Is it durable? Will it withstand exposure to the weather or other corrosive influences and will it submit favorably to physical wear?

3. Is it readily available? Can it be easily procured?

4. Can it be used with economy?

5. How will it affect the appearance of the finished structure? Is it clean and smooth or is its surface unattractive to the eye in its natural finish and incapable of readily taking an enamel or a polish?

Taking up the points in order, we find that the malleable iron casting is far superior to grey iron in both ultimate strength and elongation. Its ultimate is lower than that of cast steel but it approaches that metal in elongation, and, what is also important, its elastic limit closely approaches its ultimate strength. This fact and the fact that malleable iron in its molten state is more fluid and may be poured at a lower temperature than steel, and hence produces a casting which is more likely to be free from blowholes, permits the use of a low factor of safety in the engineer's computations.

A question which has a direct bearing on the strength of the malleable iron casting should be mentioned here.

In our former articles we described the wedge test to which malleables were formerly put. We also showed that after careful research it was found that much better results than had been anticipated were possible. We also pointed out that demands were being made on the industry for malleables which would pass a test based on tensile strength and elongation. This was accomplished by means of test bars which were cast at each heat and a careful record kept. In the present paper we show a typical test sheet, also the test bars, as well as samples of casting which have been put to a severe test.—EDITOR.

Can Heavy Sections of Malleable Iron be Completely Annealed?

We may assume that the original furnace charge has been so proportioned, and has been refined to such a point that all the carbon will remain in the combined form (carbide of iron), after the casting which we are making has been poured. This is a perfectly fair and reasonable assumption. Now all that remains to complete the process of making good malleable iron is to submit the whole of this casting to such heat treatment that the reaction which breaks up the carbide of iron into its constituents will take place.

If this can be done with a casting of small cross section, is there any logical reason why it cannot be done with one of larger section? To contend that it cannot be done is to contend that it is impossible to heat a larger section uniformly throughout its mass, which is obviously wrong in view of what is being continually done in other branches of the iron and steel industry.

A casting having very heavy sections is shown in Fig. 5. This casting is used as a transmission gear case for an extra heavy type of caterpillar tractor. It was specified in malleable iron to withstand the heavy stresses, vibrations and jars incident to such duty. It clearly demonstrates what is possible with this metal.

Closely allied to the foregoing is another phase of the subject which may well be discussed.

The Skin of a Malleable Iron Casting

As pointed out previously it is possible that during the heat treating or annealing process a malleable iron casting may lose some of its carbon. If a section of the finished casting is carefully examined under the microscope it will be found that the carbon patches mentioned before are slightly larger toward the centre of the section. It will also be noticed that there is a so-called skin, about one thirty-second of an inch

FIG. 5—EXAMPLE OF HEAVY MALLEABLE CASTING.

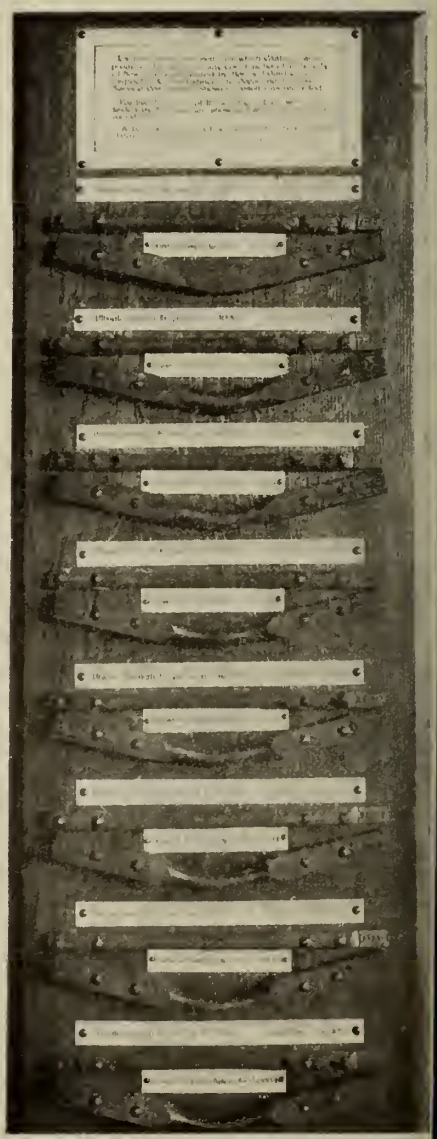


FIG. 6—SAMPLES OF RODS WHICH HAVE BEEN TESTED.

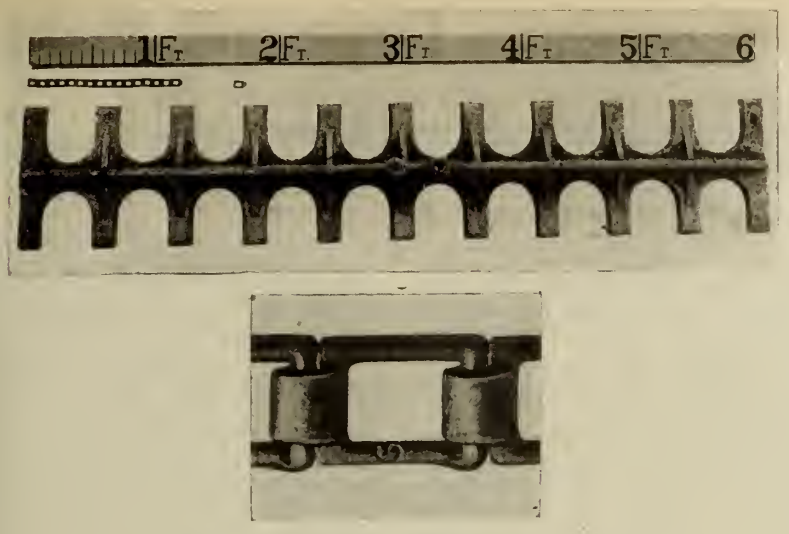


FIG. 8—A LARGE MALLEABLE IRON CASTING IN CONTACT WITH A SMALL SPROCKET CHAIN, AND THE CHAIN IN ACTUAL SIZE.

thick, which envelops the casting and which is almost entirely made up of carbonless iron or ferrite. Every casting has a skin of this nature to a greater or lesser degree, be it grey iron, malleable iron, or steel, but it is especially marked in some malleable iron. A similar skin is also found on hot rolled steel.

It may be well to explain here that it is the accepted practice in a large number of malleable iron foundries to enclose the castings in iron boxes or pots during the annealing or heat treating process, the castings being surrounded with some pulverized substance which is not fusible at the temperature of the treatment. The object of this is twofold. First, the packing, as it is called, protects the iron from "burning" by keeping the furnace gases from coming in direct contact with it. Second, it also furnishes a support for the castings which minimizes the danger of warping under the heat action. However, if the packing is of such a nature that it will give up oxygen at the annealing temperature, more carbon will be removed at the immediate surface of the casting and the skin will be more marked.

For a long time it was thought, and, unfortunately, the belief is still encountered, that the greater part of the strength of the casting lay in this skin and that the heart was practically worthless as far as its tensile qualities were concerned.

In answer to this let us consider a five-eighths inch round test bar which shows under test a tensile strength of 48,000 pounds per square inch (the average ultimate strength of all bars furnished for test during December, 1918, daily, by some thirty foundries was 50,570 pounds). Suppose that the skin on this bar is one thirty-second of an inch thick and that the remainder of the bar is "worthless" and, if the skin were removed, would test to only 30,000 pounds per square inch. Simple computation will show that in a cross section the skin makes up only 19 per cent. of the total area and therefore to bring the average up to 48,000 pounds per square inch would have to stand 124,000 pounds per square inch before fracture. It is impossible that such could be the case and yet were we to assume a truer value of "worthless" iron, for no one will admit that iron that will show an ultimate strength of 30,000 pounds is really worthless, the absurdity of the result obtained from the computation will be even more marked.

We show in Fig. 6, a series of five-eighths inch round tensile and one inch square transverse test bars which were tested by the Engineering Department of New York City's Public Service Commission during the inspection of malleable iron castings for subway construc-

Continued on page 46

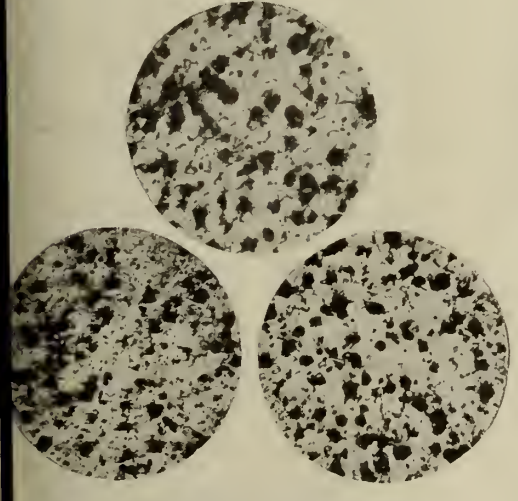
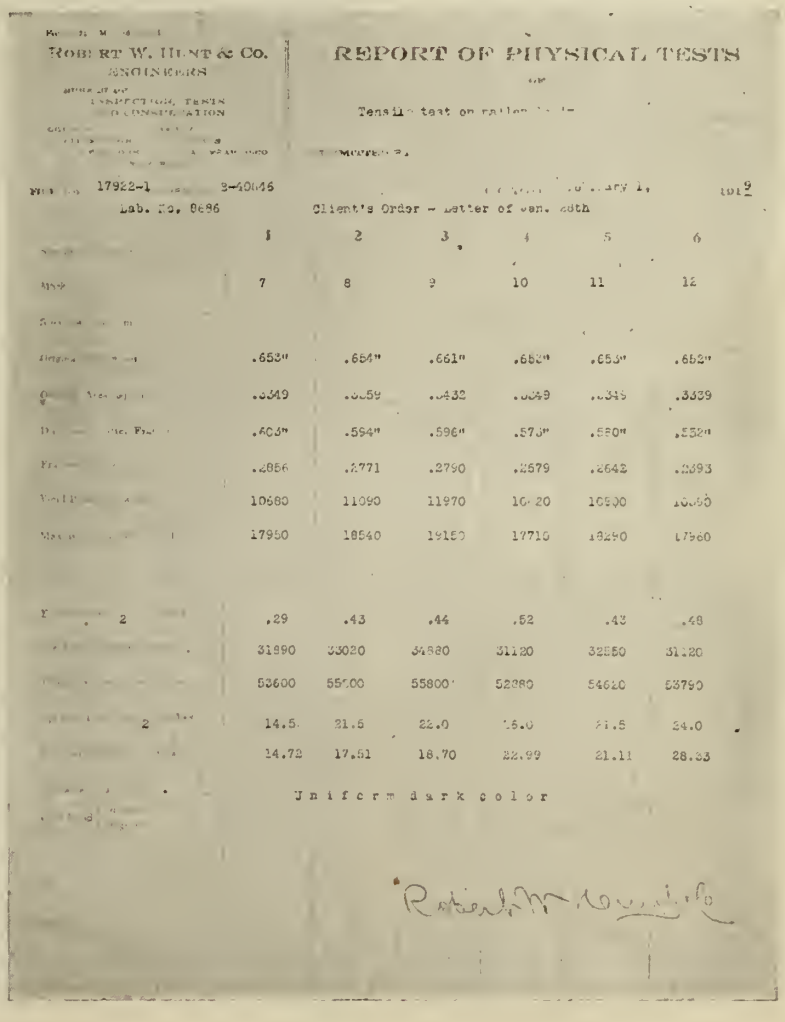


FIG. 7—MICROGRAPHS OF MALLEABLE IRON SHOWING UNIFORMITY THROUGHOUT A TWO-INCH SECTION.



ROBERT W. HUNT & CO.
ENGINEERS
INSPECTION, TESTS
AND CONSULTATION

REPORT OF PHYSICAL TESTS

Tensile test on malleable iron

17922-1 3-40046 February 1, 1919
Lab. No. 8686 Client's Order - Letter of Jan. 28th

	1	2	3	4	5	6
	7	8	9	10	11	12
	.653"	.654"	.661"	.652"	.653"	.652"
	.3349	.3359	.3432	.3349	.3345	.3339
	.603"	.594"	.596"	.573"	.580"	.552"
	.2856	.2771	.2790	.2579	.2642	.2393
	10680	11090	11970	10[illegible]20	10900	10[illegible]0
	17950	18540	19150	17710	18290	17960
2	.29	.43	.44	.52	.43	.48
	31890	33020	34880	31120	32550	31120
	53600	55[illegible]00	55800	52880	54620	53790
2	14.5	21.5	22.0	26.0	21.5	24.0
	14.72	17.51	18.70	22.99	21.11	28.33

Uniform dark color

Robert W. Hunt & Co.

Students' Course—Cores and Dry Sand Molds

Advantages of Globular Shaped Grain—Bad Judgment To Get Open-grained Sand and Fill the Openings With Loam Sand—Different Kinds of Binder.

By F. H. BELL

IN our last lesson we showed how the grains of sharp sand could be forced together with the rammer so that no escape for the gas and smoke would be possible. We also showed that if it were possible to get perfectly round grains of sand they would resist the rammer, no matter how hard wielded. In Fig. 1 is the round grained sand spoken of and illustrated in our last lesson. It is not possible to get grains as uniform as these but it is possible to get fairly even grained sand which is smooth and nearly round. If pure silica sand is used it is quite possible to make first-class cores by mixing one part of linseed or any good brand of core oil with sixty parts of the sand. The sand should be perfectly dry to begin with and after thoroughly mixing it with the oil, the necessary water is introduced

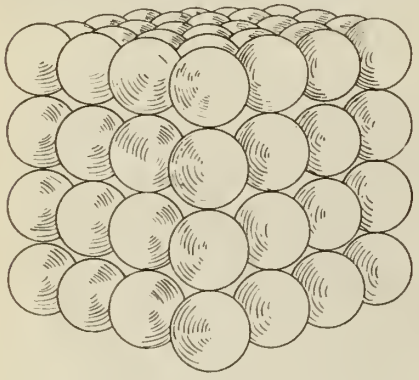


FIG. 1—IDEAL ROUND GRAINED SILICA SAND.

to make it of the proper degree of dampness. The core can be rammed reasonably hard but nothing is gained by ramming very hard, as after the grains come together they cannot be forced any tighter. If pure silica and oil are mixed in these proportions and nothing else is mixed through to hold up the green core, it will be difficult to keep the core in shape. This, however, can be accomplished by either having a dryer or else bedding the core in molding sand before removing the last section of the core box. Where any great number of cores are to be made it is always best to have neat fitting dryers to hold the core in shape while being dried. When an oil core is heated it becomes more fragile than when cold, until it starts to dry, after which it makes a very hard core. This kind of a core while being hard is exceptionally advantageous for cores which are difficult to vent, for the reason that it does not require to be vented, as on account of the fact that there are no corners on the grains to wedge in between the other grains, the spaces between the grains, with the exception of the spots which touch each other, are wide open and if placed to the lips can be blown through. I have seen cores, which were far from being simple in design made from this mixture and submerged in a casting with no way for the gas to escape without passing through another core which was resting against it. The fact that the grains are globular only allows a very small portion of each grain to touch the next one and the oil being strong holds it secure. When the melted metal is poured against it the oil holds on long enough to allow the casting to set, after which it burns out, leaving the loose silica, which can be easily rapped out next day and used over again. Cores of this kind would be expensive for work where they are not absolutely essential, as the time which is required to guard against misfortune prevents a large output for a day's work.

In Fig. 2 will be seen a somewhat exaggerated view of what is too frequently resorted to. Books often specify this very method. After specifying a coarse, even, round grained silica sand, they will proceed to mention the introduction of some molding sand to strengthen the core while in a green state. Molding sand is fairly fine; in fact, the core maker invariably selects the finest he can get. If we take one part of new molding sand and mix it with two or more of the best silica sand we have approximately what is shown in Fig. 2, which is in reality a sort of concrete. Cores of this kind are good enough for some kinds of work but the silica is wasted as any kind of sand would have answered the same purpose. All the crevices big and little are filled with the molding sand, which being composed of different ingredients can fit itself into any sized cavity. If the work is not of sufficient importance to afford the trouble of making proper silica sand cores, some of the dry compounds mixed with burned core sand and molding sand will make a cheaper and better core than can be made by doping the good silica with molding sand. A good dry binder will secure thirty times its bulk of sand if properly baked. The temperature at which the oven should be kept depends on what kind of binder is being used. A binder with a rosin base simply requires to be heated, and if heated at a high temperature it will be destroyed, whereas the black compounds require to be baked at a high temperature. The secret in using dry binders of any kind is to heat them to a high enough temperature to melt the binder. Many users of black compound condemn it because the cores are too fragile, and are apt to break when being put into the mold. And on top of this, they are as hard as stone when the time comes to rap them out of the casting. This is not the fault of the binder but of the oven man. Good ordinary cores can be made from the refuse sand of the gangway and old burned cores mixed with black compound and tempered with water, if they are baked in a hot enough oven. Every oven should have a thermometer in connection with it and cores mixed with black binder should be heated to a tem-

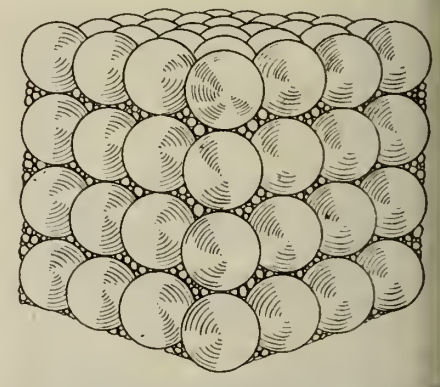


FIG. 2—HOW IT WOULD APPEAR IF MIXED WITH MOLDING SAND.

perature of 450 deg. Fahr. and maintained at that temperature until the cores are baked to the centre. By this means the binder is melted and while in that condition it runs through the pores in the sand and covers each grain binding them together, and in doing so it leaves open spaces where it had been before becoming melted. These make vents similar to those left between the grains in the silica sand cores. The quality of the sand is of minor importance because it is covered with the binder, which is very hard when baked. By baking the cores thoroughly they can be handled with safety and when subjected to the heat of the melted metal the binder will be burned out instead of being baked harder as is too often the case. For first-class cores of this kind a good mixture would be ten parts sharp sand, ten parts new molding sand, ten parts old cores and one part black compound. Another binder is known as liquid compound. Several makes of this

are on the market. It has many good qualities. For cores that will be exactly right when taken from the core box, it is hard to beat. Its main peculiarity is that it goes to the outside, forming a hard crust, while the inside dries to dust. This makes a core which will resist the metal, vent easily, crush under the strain of the shrinking metal and rap out easily from the casting. If the core has to be filed or cut in any way this is not a desirable binder as once the crust is broken the core will wash from the melted iron passing it.

Flour is the old standard core binder. Not many years ago flour was used in almost all core work, and even now it has many advantages over some of the others, but it has many disadvantages. Flour is sticky and holds the core in shape when green, and in drying it gets even more sticky, so that if it had no other qualities this one keeps it in favor. Flour is often used in small quantities with other binders with the idea of strengthening the green core, and also to hold the binder from all gathering at the surface of the core, but in most cases it is only a waste. Flour mixed with black compound is only wasted, because the temperature required to properly melt the compound would destroy the flour. Flour should never be used in any core unless it has been allowed to soak for several hours after being mixed. If a flour mixture is used as soon as mixed, a large portion of the flour has no binding effect and only goes to waste, making it necessary to use a much greater quantity of flour in order to have the core sufficiently strong. This is an extravagance, but this is not the greatest trouble. The flour which was not thoroughly saturated with water will continue to absorb dampness after the core is made, more particularly after it begins to steam in the oven. This causes it to expand and swell the core to much larger than the box in which it was made, and quite frequently to be cracked. These characteristics of flour make it impossible to mix oil and flour in the same mixture. Oil, in order to get a grip on the sand, must be mixed with perfectly dry sand, and any core mixture containing oil should be used immediately after being prepared. Foundrymen will sometimes mix different binders such as oil, flour, molasses, dry compounds, etc., in a sand mill where they will get a perfect mix, thinking by this means to get the good qualities from each. This is not usually accomplished. The bad features are about the only ones which show themselves in such mixtures.

Corn Products

While flour has its advantages and disadvantages, its advantages are so pronounced that they are hard to substitute, but its disadvantages are also so pronounced that it is desirable to substitute them. This substitute is to a great extent to be found in corn products. Corn has some of the characteristics of wheat and also has a sugar content. While corn flour has not the pasty features of wheat flour, the starch which is taken from corn can be treated with dilute sulphuric acid and put through certain processes which make it even better than flour as a binder, and void of the stifling smell. This is what is known as dextrin. It should be mixed with the sand and tempered with water and allowed to soak over night and remixed in the morning.

Other corn products are glucose and hydrol. These are much the same as molasses, but made from corn instead of sugar cane. These binders would be too expensive for core binders were it not for the fact that since chemistry has become so well understood, the different by-products which are taken from the same material makes the price of some of them low if the others are to be used for purposes where a high price can be obtained.

From what we have seen we must arrive at the conclusion that to secure a core which will give satisfaction, it is only necessary to get a composition which will be strong enough to handle, refractory enough to resist the heat, but combustible enough to burn out before the casting becomes cold, open grained enough to let the gas escape and pliable enough to yield under the pressure of the contracting metal. Whichever composition will produce these results to the best advantage according to the class of work being done, and with the least trouble and expense, would be the logical composition to use. In our next lesson we will continue core making and introduce dry sand molding, which is in some respects similar to core making, but is, of course, a different job.

A LITTLE NONSENSE NOW AND THEN IS RELISHED BY THE WISEST MEN

The following contribution has been presented to us by a molder of the type who is needed in most of our foundries. The foundry is too often filled with men who do not see much in life, and it is refreshing to have the men look upon the humorous side occasionally. This molder and some others formed a syndicate in a flourishing Canadian industrial centre with the object of starting a foundry, but before spending their money decided to see if there would be anything to do in the way of filling orders after the foundry was completed, but after scouring the neighborhood for orders, were forced to the same conclusion as the farmer who saw a giraffe for the first time. He looked up and down its long legs, then up its telegraph pole of a neck, and said to his pal, "Come on, Bill, there ain't no such animal."

However, this molder is not discouraged and will open up a foundry as soon as things look a little brighter. In the meantime he is good-natured and as we have said has contributed a foundryman's dictionary with some terms and synonyms which will, no doubt, be appreciated by the average molder.

I, Swab-pot:—A small receptacle containing a vile looking liquid, actually H_2O, and a piece of battered rope, the latter usually missing when needed; often sought but seldom found when wanted in the average jobbing foundry; of great utility when about to draw a pattern, or when desirous of anointing the youngest apprentice across the back of the neck.

II, Claywash:—A mixture of clay water with the various solids which drop from the foundry beams and crane, and tobacco juice squirted into it with unerring aim by passersby, invaluable for making sand stick to gaggers, box bars, overalls and the human frame. Comes off in flakes when dry.

III, Shovel:—A useful instrument when filling molds with sand. Issued in brilliant, shiny condition; soon loses lustre, also frequently finds new owner. Remarks when lost: Anglice, "Wh[illegible] had my — — — spade." French-Canadian ditto, "Sacre! — — — — mon pelle est perdu!!!!"

IV, Crane driver:—A long-suffering member of the working force, much maligned all day by all; a bosom friend to the heavy floors at casting time. Usually half choked by oven fumes, blacking and sea coal. After careful washing becomes almost human.

V, Pattern brush:—A handy tool. Makes splendid clothes brush; often found in peregrinating molder's outfit. This is good for the supply houses, but bad for the molder working on the bench at the other end of the shop.

VI, Foreman:—Hands out the jobs; takes up the heats; responsible for costs, good work, bad work, etc. Described variously throughout the shop as "a pretty good scout," "an old woman," "wouldn't hold his job if it wasn't for me." Bears most of it patiently. Has been known to smile.

Victoria.—To encourage the establishment of the iron and steel industry in British Columbia, the Provincial Government has entered into an agreement with the Coast Range Steel, Limited, whereby the Government promises to pay bounties not exceeding $3 per long ton on pig iron manufactured from ore mined in the province. The agreement sets forth that British capitalists are prepared to invest the necessary capital, "not exceeding £10,000,000," in the establishment of the industry. Engineers are now investigating the resources to ascertain if conditions are suitable for the establishment of the industry.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

QUESTIONS AND ANSWERS

Question—We have a new nickel plating solution which is causing us considerable trouble and which we do not feel capable of correcting. Will mention a few facts with respect to the case and trust you may be able to advise us as to best method of getting production from the solution. There are 680 gallons of nickel solution, made from following formula: 300 pounds double nickel sulphate; 40 pounds single nickel sulphate; 43 pounds common salt, and 250 pounds of boracic acid. In this solution we have suspended 54 16-inch anodes of narrow cross section on 3 rods, thus permitting 2 rows of work to be plated per load. The average load consists of 12 rather bulky pieces which have an area of about 3 square feet each. The solution is operated cold and with a very weak current. The actual voltage of amperage used is unknown as we have no instruments of measurement in our plating room. Our product has about 50 per cent. of its total surface tinned as it enters the nickel solution, the remaining 50 per cent. of the surface having been polished to the base metal which is sheet steel. It is this tinned surface which causes us the trouble, it will not plate, but quickly becomes covered with black streaks and remains repellent to nickel deposition during immersion. Small portions of the surface between streaks will acquire a slight deposit which easily peels off, leaving a very ragged surface to refinish. Pieces which have entire surface polished or which have not been tinned take on a very satisfactory plate if not allowed to remain in the bath more than fifteen minutes. The anodes in this tank are all new and still hard.

Answer—Your problem would furnish excellent material for an article on nickel solutions, their preparation and operation. To 680 gallons of solution you have 340 pounds of nickel salts or ½ pound per gallon, and suspended in this solution you have 54 16-inch anodes which we may assume have a total effective surface area of about 18 square feet, and your average load has a surface area of approximately 36 square feet, or twice the effective anode surface. This condition does not have a direct bearing on your present trouble, but is very liable to prove expensive before a year passes. The source of present trouble is evidently in the boracic acid. If you have 250 pounds of boracic acid in the 680 gallons of solution, you have approximately 6 ounces per gallon. This is too much. Five ounces per gallon is the limit for solutions used at temperatures below 80 degrees Fah. In your case you have an excess, this excess together with the natural acidity of the nickel solution presents a very strong acidity, the extreme acidity and low metal content make the solution badly unbalanced. The bath being new and possibly not thoroughly worked before being used for regular deposits, you have a condition favoring chemical action on the tin before the formation of a film of nickel is possible with the very weak current which you employ. If you were to continue using the solution as you have been, the deposits would gradually improve, but this would be contrary to good practice. The better way is to simply electrolyze the solution by hanging a small cathode on the negative poles and passing all the current available at usual voltage for several hours, one or two days if possible. If crystals of boracic acid collect at surface of the solution, remove them with a skimmer. If crystals have formed on the anodes or sides of tank it will be advisable to remove them. When placing work in the tank have current turned on lowest point of switch and gradually increase the current as load is added until full allowable current is flowing through the bath. We would naturally expect that when the solution is aged and the anodes begin to feed the solution, the deposit will be quite bright and brittle, so would not advise the production of heavy deposits from this solution while it has present high content of boracic acid. It is quite possible that you may be able to increase the speed of deposition considerably, as boracic acid has a retarding effect upon the deposition of nickel from a bath containing appreciable quantities of the acid. Baths prepared after such formulas as you furnish us are rather an exception today. It is obvious that speed of production interests you but little, as the bath in question is one with which ample time must be allowed or results much more difficult to remedy than present trouble would occur. You could greatly improve the bath by increasing the metallic salt content to at least 12 ounces per gallon and the common salt to 2 ounces per gallon, then hang in at least 54 more anodes. The anodes for a solution such as yours should not be too high in nickel; we would say 90-92 percent. would be about right. Nickel anodes of higher percentage require strong solutions and special corrosive agents to facilitate continued successful operation of the nickel solution. While we do not wish to excite your interest in concentrated nickel solutions, we would strongly advocate improving the solution you have adopted. It will prove more economical.

THE AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1920-1921.

President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

* * *

Question—I have operated hot cyanide copper plating solution on steel wire novelties for past twenty-five years, and until about one year ago I had practically no trouble. During the past year my life has been made a burden by reason of a variety of little imperfections which are apparently in my copper plate. Black spots, specks, streaks, etc., are numerous, occasionally the deposit chips off during subsequent finishing operation. Several months ago I made a new copper solution. Results have been no better. Today upon close inspection I found what I believe to be the true source of the difficulty. The wire stock is badly eaten by rust, and bears evidence of scale or similar material having been rolled into the wire during manufacture. Furthermore, the copper coating which is on the wire when I buy it appears to be very easily attacked by ordinary cleaning solutions and becomes discolored to such an extent that strong cyanide solution does not restore clear clean surface. Now when the wire is placed in copper plating tank the copper deposits very slowly on the discolored wire and often actually appears dark when treated several minutes, when previously a clean bright finish was obtained in one minute and never a complaint. I have worked with this problem for months; now I must admit defeat. Please put me right on this.

Answer—We are of the opinion that you had just about solved the problem when you wrote us. From what you write it appears that the "big idea" is to treat the wire either mechanically or otherwise before plating, so that a clean steel surface may result. We believe the copper coating which is on the wire is really the greater source of trouble. But undoubtedly there is a great difference in wire with respect to its acquiring a copper deposit in a cyanide solution. If the wire article can be tumbled in dilute cyanide solution or tumbled in dry fine sawdust and pumice, it should aid in im-

proving the results. Keep the cyanide content of the plating solution as high as possible. Anodes should keep quite clean. If slight sluggish action is noticed, dissolve small quantities of either copper carbonate or copper cyanide in solution. Very small additions of hyposulphite of soda or sugar of lead may be made to assist in producing clean clean plate, but if you get a clean wire before placing in copper solution, your problem is solved.

* * *

Question—We operate three nickel plating machines of the rotating type and during period of use they have been under supervision of an experienced plater. Recently this man severed his connection with our firm and we have endeavored to get along with a helper and now find the small articles plated in these cylinders are not receiving usual plate; the color is very dark and does not color up by subsequent dry tumbling. Shall be grateful to you for any information you may be able to give us relative to getting better results.

Answer—To satisfy yourself that the plating machine is in good working condition, inspect all joints and points of contact in the electrical circuit, see that the tank does not contain excess amount of sludge and thus insulate the anodes to great extent. When certain that the mechanical and electrical features are in good shape, try a batch of brass work. If the deposit is still dark and as you describe, add about one pint of sulphuric acid to each 75 gallons of solution, test with litmus paper. If scarcely any change has been effected, add another pint of acid and test with litmus again. In view of the fact that you now get a deposit though dark, we believe that one quart of acid, or less, will suffice to produce sufficient acidity to facilitate deposition of white plate. Naturally, we expect that you have assured yourself that there is sufficient metal in solution. A mere hydrometer test will serve you sufficiently accurate for this. Solution should register about 10 degrees before above addition of acid is made. If not, it would be quite proper to add nickel in the form of salts, first dissolving the salts in a small portion of the solution.

* * *

Question—Kindly inform me of the ampere capacity of dynamo which would operate a 64-gallon acid copper solution to deposit copper on 6 sheets 18 inches by 25 inches. Also what is the composition of the bath used for this work?

Answer—The six sheets have a total surface of approximately 37.5 square feet and to deposit copper on both sides would require a 1,000 ampere machine, or if copper were deposited on one side only a 500 amphere machine would suffice. For this work an electrotyping machine would be advisable. If you choose to use a cyanide plating solution you would require a 200 gallon tank and a 500 ampere machine would answer your purpose for plating both sides as the current density per square foot is considerably less than when using an acid solution.

The acid solution is composed of 14 per cent. copper sulphate, 2 to 3 per cent. sulphuric acid, in distilled water, or filtered rain water. A cyanide solution may be made from sodium cyanide 12 ounces, sodium carbonate 3 ounces, copper carbonate 6 ounces, per each gallon of water. Dissolve the sodium cyanide in small amount of water, then dissolve copper carbonate in the sodium cyanide solution, then add the sodium carbonate and stir well. Use copper anodes and operate at 5-6 volts, using regular plating dynamo.

* * *

Question—What method of cleaning would you suggest using in a job shop on sheet metal preparatory to enamelling?

Answer—Swab off with some good cleaning solution used hot, wipe dry with cloths, rub with pumice, dry by wiping and subsequent oven heat, then dip in enamel.

* * *

Question—In attempting to make a copper reproduction for the manager of our factory I used dry cells to operate the bath during nights. I have failed to get results from this method. Please advise me how to run bath continuously by using battery alternately with dynamo.

Answer—Possibly the best battery for your purpose would be the type usually used on motor cars and sometimes termed accumulators. One of these would operate your bath for several nights without recharging unless your cathode is large, or you could manage to get the job finished by using a close circuit cell if you gave it proper attention. The use of dry cell is possible but will cause you much annoyance. It will be necessary to couple several cells together. Now there are certain results obtained by coupling the cells and we will describe the method briefly so you may more readily understand the results. If we have a number of cells, each cell having an output of 1.5 volts and we wish to obtain the combined strength of all the cells we may connect them in series. That is, the zinc pole of the first cell is connected to the carbon pole of the second and so on. If the battery consists of, say, six cells, the total strength of the current obtainable would be six times the output of one, or nine volts. The total number of amperes obtained in this battery would remain exactly the same as the number contained in each individual cell. If the amperage of one cell is eight, then the battery of six cells will produce a current of eight amperes at nine volts. The strength of the current (in amperes) is not affected by connecting the cells in series. Now if we wish to increase the strength of the current (in amperes) we connect the cells in parallel. That is, we connect the carbon of the first cell to the carbon of the second cell and so on, and the zinc of the first cell to the zinc of the second cell. Now with six cells of eight amperes each and each cell 1.5 volts we have a current strength six times as great as formerly, while the e.m.f. in volts will remain the same, or we have 48 amperes at 1.5 volts. The above will furnish you with sufficient material for an experiment with cells you now have and in the meantime you can negotiate the loan of a suitable storage battery.

WANT UNIFORM NUMBERS FOR GRADING MOLDING SAND

Mr. Theo. B. Eby, of the Venango Sand Co., Franklin, Pa., reports that "The American Society for Testing Materials," of Providence, R.I., are planning to get all foundry associations together for the purpose of advocating a uniform grading of sand. Under existing conditions each sand company has its own grading system, and there is a diversity of grades which the purchaser cannot be expected to understand. It frequently happens that a large consignment is shipped after being ordered according to some number, and on arrival at its destination is found to be useless for the buyer's requirements and he is forced to reject it. It would then be necessary for the shipper to make a trip to the point of delivery in the hope of selling it to someone else, in all probability at a loss. Railway and hotel expenses added to the reduction in price makes a big loss to the seller, but perhaps not as great as that sustained by the intending purchaser, who is forced to wait for another shipment. By adopting a uniform grading system this would be eliminated. This would mean that many of the older shipping districts would have to adopt new methods on account of the deposits being exhausted. Natural sand is not any too plentiful in any locality, and when the loam or top surface is all taken the lower strata, while being good sand, is not as rich in bond as the top layer was and in order to use it for the same class of work it requires to be mixed with a loam having a high bond. This can be done by using sand mullers. The day is probably not far distant when this method will be universal. However it is advisable that something should be done at once to improve the present methods, and with this in view the American Sand Association, at their next meeting, which will be held at the Cleveland Hotel, Cleveland, Ohio, during the present week, will urge the co-operation of all its members in an endeavor to arrive at a satisfactory uniform grading system.

Change of Address.—The Pittsburgh office of the Independent Pneumatic Tool Company, was moved on February 26 from the old address of 1208 Farmers Bank Building, to Bessemer Building, Sixth Street and Duquesne Way, Pittsburgh, Pennsylvania.

Items of Interest to the Brass Foundry

WANTS RECEIPTS FOR BABBITT METAL

Editor:—Will you kindly give me some receipts for babbitt metal and tell me how to mix them. I want some for heavy service and some for cheaper and less important work.

Answer:—Babbitt metal, originally known as Babbitt's metal from its inventor, was composed of copper, antimony and tin, in the proportion of approximately 5 of copper, 8 of antimony and 87 of tin. This was figured out with great care, the tin being the anti-friction ingredient, the antimony being the hardener and the copper adding strength. This original babbitt metal is still the standard with certain variations. Babbitt metal is made with various ingredients, and varying considerably in the amounts of the various constituents, as tin, copper, antimony, bismuth, zinc and lead, in order to make the metal suitable for the various conditions of bearings, weight and speed of rotation of the shafts and spindles for which it is used. In making babbitt metal it is best to make a big batch and pour it into ingots, which are remelted when required. This is practically necessary on account of copper being melted at such a high temperature that it is necessary to use a crucible, and this wohld not be profitable if just melting a little bit for each job being done. First melt the copper in the brass-furnace crucible and when sufficiently melted the tin can be stirred through until the capacity of the crucible is reached. The balance of the tin can be melted in an iron ladle on the forge and the contents of the crucible poured into it and thoroughly stirred before pouring into the ingots. For the average run of work there is nothing better than four pounds of lead and one pound of antimony. There is no metal has any greater anti-friction qualities than lead, but on account of its soft nature it will not hold up the load. The introduction of antimony gives it the hardness necessary to hold up the load and resist the wearing action of the revolving shaft. Antimony also has the qualification of not shrinking when cooled and this is what is required if the metal is to be poured into iron journal boxes. Bismuth also possesses the characteristic of not shrinking and is a good hardener. Zinc, while hard, is not possessed of good anti-friction qualities.

NECESSITY OF KNOWING THE TEMPERATURES AT WHICH METALS MELT

Every book or paper published on non-ferrous metals gives the temperature at which each metal fuses, but how many founders ever think of the value of this knowledge or put it to any practical use? Speak to one of them on the subject and he will tell you that he knows from the looks of it when it is properly melted, or that he tries it with an iron rod. This kind of knowledge is all right and the use of the pyrometer is not necessary if we take advantage of the knowledge which others have gained and passed on to the world. Thus we read that copper fuses at a temperature of approximately 2,000 degrees, tin 440, zinc 750, antimony 830, lead 612, etc. The word fuse is meant to denote the point at which the metal changes from a solid to a liquid, but not at a temperature where it could be successfully poured. We also read that zinc will burn and even blaze if heated to a much higher temperature, and that in order to heat it sufficiently to melt it it must be kept under cover. In addition to this we read and also know from experience that metals when mixed melt at a lower temperature than the mean temperature required to melt the component parts. With all of this information it should be an easy matter to make any kind of a mixture without materially changing the chemical content through burning, yet how many take advantage of the knowledge?

In an American publication an article written by one of America's leading authorities on brass founding describes how he produced a nice appearing red brass at a reduced cost. In his formula he begins with scrap metal without specifying what brand of scrap. If he selected all good machinery scrap which was made of copper and tin he might as well have used it without any other addition, unless it would be a small piece of tin. If he used indiscriminate scrap which might contain zinc, antimony, etc., he would have to be careful in melting.

However, the programme is as follows: Scrap metal, 71 pounds; copper, 25 pounds; tin, 1 pound; lead, 1½ pounds, and zinc, 1½ pounds. First melt the scrap under fine charcoal, and this is followed by the addition of the copper, tin, lead and zinc in the order named. Now as we have seen, tin melts at a temperature of 440, zinc at 750 and the other alloys at similarly low temperatures, while copper will not melt with less than above 1,900. How then are we to melt the copper in the crucible containing the melted scrap metal unless we heat the latter to a temperature approximating 2,000 degrees? And in such case what is going to become of the zinc, etc., in the scrap when melted at this temperature? Always melt the copper first and then add the alloying metal in the order of their melting temperatures. It must be remembered that even though melting heavy brass scrap along with copper wire or clippings the copper must be melted first as it requires a higher temperature to melt it. Copper wire will melt quicker than bulky copper chunks but it takes the same degree of heat to melt it as is required to melt chunky pieces of copper, whereas the heavy brass scrap which is slow to melt simply requires the low temperature required to melt light brass.

SMALL ELECTRIC FURNACE

A convenient laboratory electric furnace for temperatures up to 2,300 degrees Centigrade is described in a recent issue of "Chemical and Metallurgical Engineering." This furnace is of the granular coke-resistance type and uses 1-inch graphite electrodes, and 1¼-inch graphite crucible. The rods, supported by suitable sized pipe-fittings, pass through silocel brick, and continue to within 1½ inch of the crucible. Granulated coke is used to fill the space around the electrodes and crucible. The crucible is made by sawing off a length of graphite rod of desired diameter, and drilling out the centre in a lathe. The entire furnace is constructed of 9 in. by 4½ in. by 2½ in. silocel blocks, and is heated by an air-cooled, step-down 2.5kva. auto transformer. The primary is wound for 220 volts, having eight different taps for connections which give a voltage range of from 20.7 to 38 volts on the secondary.

This arrangement does not require the use of any outside resistance, as the current and temperature are controlled by means of the various contacts on the primary winding, and also by varying the pressure of the electrodes on the granulated coke between the electrodes and the crucible. The transformer is connected to the furnace electrodes with stranded copper cable. The corresponding amperes for the eight steps on the primary winding range from 65 to 120 amperes, or from 78 to 144 amperes, with 20 per cent. overload, which may be drawn for short intervals (20 to 30 minutes) without hurting the transformer. Temperatures as high as 2,200 degree to 2,300 degrees Centigrade have been obtained from the above, from a cold start, in 20 minutes.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

ELECTRIC TOGGLE JOLTING MACHINE

The American Foundry Equipment Co., 366 Madison avenue, New York, have perfected what they call their electric toggle jolt table, for which they claim many exclusive features. In design they have departed radically from other types, most of which operate by compressed air. This is probably the first application of the toggle lift to such machines. The toggle joints are not subject to the rapid and unequal wear frequently experienced with cam actions. When appreciable wear has taken place it can readily be corrected at slight cost by renewing the bronze bushings of the toggle joints.

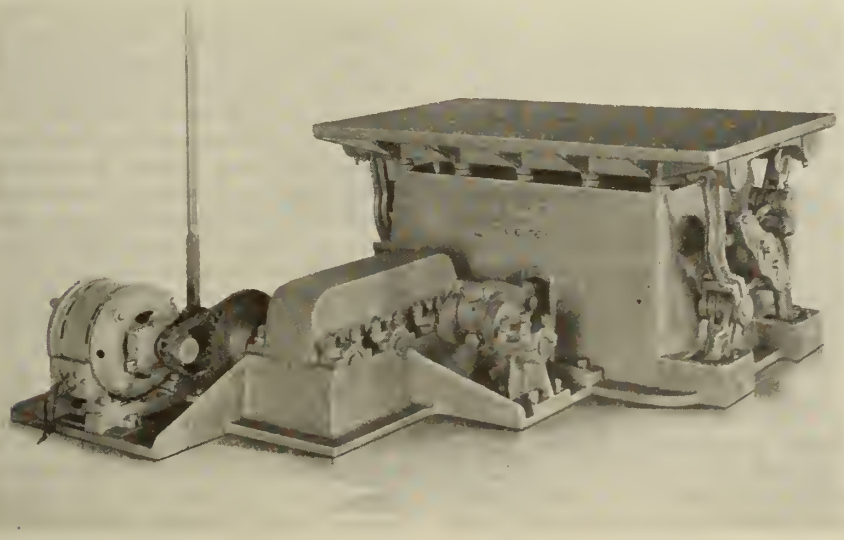
The table is a planed cast iron or steel slab with apron flange, stoutly ribbed, and with accurately planed jolting pads spaced 12 inches or less apart. It rests and jolts upon corresponding pads of the heavy cast iron base. Long tables are built in sections, with tongue-and-grooved joints and joining plates beneath.

Two or more pairs of cast steel reciprocating toggle arms are the means of raising the table, then allowing it to drop abruptly as the toggle joints pass their centers. Each pair of toggle arms operates by the oscillating motion of a steel rocker arm with rods connecting the joints of the toggles. The rise and fall of the table is one inch.

The drive is by electric motor.

Transmission from the motor is by sprockets and steel roller chain, through a series of three covered spur reduction gears, to a crank shaft. A steel connecting rod transmits motion from this crank shaft to a bell crank on the horizontal rocker arm shaft inside the table base. The essential feature of this connecting rod is an escapement slot which allows the bell crank to shuttle to the opposite position each time the toggles pass over their centers.

It will be observed that the entire transmission is mounted upon a special base casting. An upright lever operates a clutch which starts and stops the mechanism.



JOLT RAMMING MACHINE. OPERATED BY ELECTRICITY.

DOUBLE BENCH PRACTICE

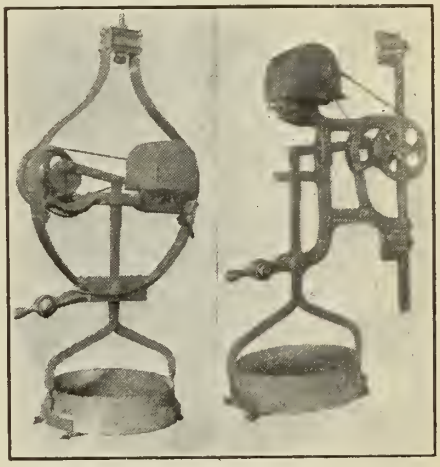
The Chain Belt Company, Milwaukee, Wis., have adopted a system of putting two machine operators or bench molders on each sand heap, one working at the right and the other at the left of the sand heap.

Aside from the weighty argument, "We have always done it the other way," they have yet to learn of any reason for opposing the double bench plan, and the advantages of it are many. Careful analysis of any large foundry proves that 40 per cent. of the molders naturally seize the butt of the shovel with the left hand. Such men are actually working at a disadvantage in the ordinary way. Another 20 per cent. will be found ambidextrous as regards shoveling, using either hand with equal facility. By a little observation and judicious switching of the men in changing to the double bench plan, all difficulty will be avoided and the men will be quick to recognize the extra working convenience of a wide, clear sweep of floor. Regard must, of course, be had for the different grades of sand used and arranging the work so as to have both men doing a class of work for which the sand is suited.

What was probably their original object was to save time in cutting up the sand heaps. This is done with a sand-cutting machine, which will handle the double sized heap with practically the same ease as it would the smaller one, but since adopting the system they find that double piles of bottom boards leave more freedom of action than single ones and all things considered the change was a good one.

NEW MECHANICALLY OPERATED RIDDLE

The Chicago Molding Machine Company, 2028 North Major avenue, Chicago, are putting on the market what they claim is the first successful mechanically operated riddle, made in the United States, and now being adapted to all classes of work. It is made in two types, one the wall type and the other the trolley type, both of which are shown in the illustration. As will be seen, they are similar in many respects, the one hangs on the trolley, while the other fastens against the wall.



TROLLEY AND WALL TYPES OF MECHANICALLY OPERATED RIDDLE

The device is especially designed to stand up under the abuse that foundry equipment is usually given. It can be mounted in a core room for mixing core sand, or for mixing facing sand for floor molders, over a tub in a brass foundry, against a brick wall, post or partition for stationary bench molders. It can also be bolted to the side of the Howe, Moline, Federal and other types of molding machines using railroad rails or H beams.

A notable feature is that it consists of only four castings, a motor and two automobile bearings to make it complete.

This should be an argument against its getting out of order, breaking down or wearing out prematurely, as there is very little to it to go wrong. The main requisite would be to keep the motor bearings well oiled.

Gear Patterns—Making the Teeth in a Jig by Hand

Laying Out One Tooth on the Jig Saves Laying Out Each Tooth —Jigs Described for Epicycloidal or Involute Teeth, Either Bevel or Spur

By H. J. M'CASLIN

IN place of having to lay off the tooth curves or outlines on each individual tooth it is best to make a hard wood jig of the exact outline of the tooth and use it in forming all of the other teeth. Fig. 7 shows such a jig for a

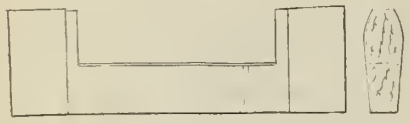


FIG. 7—JIG FOR SPUR GEAR.

FIG. 8—JIG FOR BEVEL GEAR.

plain spur involute gear and Fig. 8 such a jig for an involute bevel gear. It will be noticed that the jig is cut down or relieved for a short distance each side of the space which is to receive the block for the gear tooth. The opening in the jig to receive the block should be the exact length of the teeth across the face of the wheel and the blocks trimmed to fit snugly and then secured with screws as shown.

After the block has been secured in the jig, a plane is clamped in the vise as shown in Figs. 9 and 10. Blocks should be clamped to this plane at such points that the blades of the plane cannot cut the face of the jig. It is on this account that the clearance is provided in the face of the jig at each end of the tooth block. Fig. 10 shows an end view of the block and plane with the stops removed so as to show the different positions assumed by the jig in working out an involute tooth. In working out an involute tooth a plane having a flat face may be used and it is well to make a special plane with a long sole so that it will not be necessary to use blocks to piece it out when working long teeth.

FIG. 9—PLANE CLAMPED IN VISE.

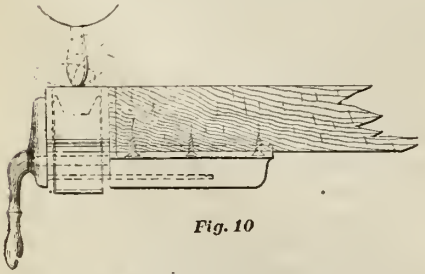


FIG. 10—ANOTHER VIEW OF PLANE CLAMP.

In establishments where a sufficient volume of business is done in gear patterns, a machine similar to a four-sided planer can be used for making teeth, but where the business does not warrant this or a real gear pattern cutter, more or less hand work has to be done. On different occasions we have shown how the tooth can be sand papered into shape by placing it in an open sided box with ends the exact shape of the tooth and pressing it against a small sand paper drum revolving in the lathe. The drum would have to have an inset the thickness of sand turned into it of the exact length of the tooth. By this means the wood beyond the sand paper will hold back the tooth jig without wearing it away, when the sand paper has cut the tooth down to the shape and size of the jig. This is considered a good way to make a tooth, but, of course, it takes some preparation and it monopolizes the lathe, preventing anyone else from using it, and incidentally it requires power, so while it is all right there are other methods which have their adherents. The method here described is done entirely by hand.—Editor.

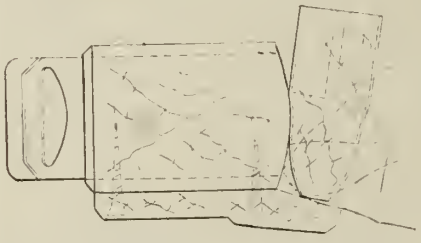


FIG. 11—PLANE WITH CURVED FACE.

When working out epicycloidal teeth it is necessary to use a plane having a curved face as shown in Fig. 11, and also to use a block or stop on the side of the plane as shown. The curve of the face of the plane should be of less radius than the curve of the flanks of the teeth.

In laying out the wooden block for the spur tooth jig the device shown in Fig. 12 will be found very handy for laying off the tooth curves. In the device shown the jig for a 16-tooth pinion is being laid out. A hard wood board A is taken and a slot cut in one end that will just fit the jig block. The jig block is placed in position as shown with one end flush with the face of the board. The tooth is then laid off. After this the jig is removed and placed other end to in the slot, when the same centres can be used in laying off the tooth outline. This insures an accurate layout on both ends of the block and brings the layout on the two ends in line.

After the teeth for the spur gear have been planed out in jigs, they can be tested by placing two of them end to end and seeing if they coincide, then reversing both teeth and placing the opposite ends in contact. If there is any error in the teeth it will be doubled by this method. Care should be taken to have the bottom of both blocks planed free from wind and to fit accurately on the outside of the cylindrical portion of the pattern.

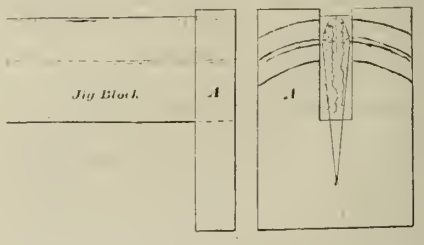


FIG. 12—DEVICE FOR LAYING OUT TEETH.

THE AMERICAN FOUNDRYMEN'S ASSOCIATION RECEIVES THOUSAND DOLLAR CONTRIBUTION FROM MR. H. S. SIMPSON

In our report of the Columbus Convention in the October issue of Canadian Foundryman it will be remembered that mention was made of different contributions from prominent foundrymen towards a research fund. This fund is to he used in the endeavor to find out better methods of doing things in connection with foundry work and in proving which is really the best method of doing things which are now done in different ways, and in fact generally improving and elevating the foundry business. Some of the contributions were to be invested and the interest used for research work, while others were given with the understanding that the research work was to be along certain channels such as cupola work only. Now comes a letter from Mr. H. S. Simpson, president of the National Engineering Co. 549 West Washington Street, Chicago, together with check for

$1,000 made payable to the American Foundrymen's Association.

The letter, which follows, explains itself:

Mr. C. E. Hoyt, Secy. and Treas.
American Foundrymen's Association,
Marquette Building, Chicago.

Dear Sir: At the 25th annual convention of the American Foundrymen's Association held in Columbus, October, 1920, contributions were announced, disclosing a desire on the part of certain members to donate to a fund to be used by the directors of the association in conducting research work and furthering the advancement of the industry.

Learning that the association could use additional funds for this work, it is our desire to assist, and accordingly wish to contribute the sum of one thousand ($1,000) dollars, a check covering this amount is herewith attached, to be placed at the disposal of the association absolutely without any restrictions, to be used for any purpose deemed advisable by the officers or directors of the association.

Very truly yours,
H. S. SIMPSON,
President National Engineering Co.

In reply the secretary of the association sent the following reply to Mr. Simpson:

Dear Mr. Simpson: It gives me great pleasure to acknowledge receipt of your letter under date of February 23, and with it a check to the amount of one thousand dollars ($1,000) as a contribution to the American Foundrymen's Association, to be used at the discretion of the board of directors, for research work and furthering the advancement of the foundry industry.

It has also given me great pleasure to report this splendid contribution to President Bean and Vice-President Messenger, and we will in due course make formal announcement of this gift to the directors and members of the association.

This gift is especially gratifying, coming as it does in the interim between conventions and is an indication of your desire to assist in the advancement of the foundry industry through the medium of the American Foundrymen's Association. Placing this fund at the disposal of the directors without restrictions is an evidence of your confidence in their good judgment and ability.

Without waiting for formal action by the board, it is my pleasure as secretary to accept and thank you for this contribution in the name of the officers and members of the association. We have deposited this check with the Harris Trust and Savings Bank, Chicago, in a savings account known as the American Foundrymen's Association, Simpson Fund. Yours very truly,

C. E. HOYT, Secretary.

The secretary also sent the following letter to the Board of Directors, American Foundrymen's Association:

Gentlemen: I take pleasure in enclosing herewith a copy of letter received from Mr. H. S. Simpson, president, National Engineering Co., 549 West Washington Street, Chicago, together with check for $1,000 made payable to the American Foundrymen's Association.

I also enclose copy of our reply. This correspondence will acquaint you with the fact that Mr. Simpson made this contribution without any restrictions whatsoever, expressing his confidence in the board to use the funds wisely for the good of the foundry industry.

Our research fund is gradually increasing. In 1916, following the Cleveland convention, the Cleveland committee found, after paying all bills, they had a balance of $337.11. This, by resolution of the committee, was voted to the American Foundrymen's Association to start a research fund and was deposited with the Superior Savings and Trust Co. in a savings account, and on December 31, 1920, amounted to $394.89.

The next contribution was from Mr. Thomas W. and John C. Panghorn. This was announced at the Columbus convention last October. This fund was deposited with the Harris Trust Company and on December 31, with interest, amounted to $2,512.50, and with the addition of the Simpson Fund of $1,000, it will be seen that we have in our research fund a total of $3,907.39. This, you will understand, does not include any of the endowments received, the income from which is to be used for making annual awards.

Your officers now have under consideration the starting of some special research work that will be of general benefit to the industry, including all classes of foundries, and we will report further to you what these plans are when they are in a more definite form.

Yours very truly,
C. E. HOYT, Secretary.

Any further comment on our part is unnecessary. We know Mr. Simpson, and have always held him in high esteem, but in this latest move he has elevated himself to a higher plane in our estimation.

The American Foundrymen's Association is an educational institution in itself and contributions such as this make it possible to cover ground which could not be covered by conventions and exhibitions.

One unpleasant feature which we have pointed out on former occasions and which we will take advantage of this occasion to touch on again, is that there are foundrymen in Canada and presumably elsewhere, who make it their business to deliberately attend the conventions and reap all the benefit they can from them and make no secret of the (imaginary) fact that they are harboring in their bosom some valuable knowledge which they do not intend to divulge. If they are, we can not agree with their policy, but unless they are working alone in some windowless basement, we fail to see how they are keeping any foundry secrets. As a matter of fact there are few foundry secrets, but there are many foundry conundrums which have never been properly unraveled, and there are undoubtedly many valuable things which have not yet been thought of but which will come to light when their turns come, and research work will hasten their turn.

HOW TO OPERATE A SAND BLAST

(Continued from page 27)

otherwise condensation from the air may dampen the sand. Consider the sand blast as a machine that does good work and give it an occasion cleaning both inside and out, especially the dust arrester.

As far as possible try to keep the hose laid out flat and straight. It will last longer than when thrown down, bent and kinked. Do not hang it over a peg in the wall. The outer skin may become worn by running on the floor or over rough castings. Do not shut off the flow of sand by kinking the hose, it will quickly spoil the hose.

All nozzles wear rapidly and require frequent renewals. Using worn nozzles increases the consumption of air and adds to the load on the compressor. Keep the compressor in as good condition as any other engine used for the generation of power. Clean it, oil and grease it regularly. Place it in the engine room where it can receive proper attention. Th air intake should be outside the building and covered with a cloth and wire screen to insure a supply of cool, clean air.

The most important points to be observed in the care of a mechanical sand blast installation are to keep it clean, and oil and refill the grease cups regularly. Handle it with care and watch the moving parts for wear, replacing them before they were out. The best results will be obtained by operating them at the pressure and speed specified by the makers. Keep the bearings oiled on the exhauster and watch the blades for wear. This machine is handling gritty dust which cuts quickly. Keep the housings tight. In the dust collector, keep the joints and surfaces tight, watch for wear in the outer skin from the whirling sand and patch promptly. Keep the outside painted.

Keep the grease cups filled and bearings clean on all of the dust handling equipment. Examine the buckets and belt and the spiral conveyor for wear, and see that they are repaired or replaced when necessary. These appliances do the heaviest work and will wear steadily.

Use dry sand and dry air to obtain saisfactory working conditions.

Do not allow any fooling with the sand blast nozzles; it is dangerous and liable to cause serious personal injury and perhaps death.

B. G. NEWTON, Manager
A. R. KENNEDY Managing Editor
F. H. BELL, Editor

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal Devoted to the Foundry and Metal Industries

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Canada a Favored Land

CANADA is without a doubt the most favored land in the world to-day. While panics and famine rage in some countries and unemployment is visible on every hand in others, Canada is moving along at a satisfactory pace. To be sure there is no boom, but conditions are far from those of panic. It seems hard to remember that before the war certain seasons of the year were always quiet, and after having such an abnormal demand for labor and good wages, to have to come back to the old conditions seems like a real hardship.

Of course if a man is out of a job it is a hardship now, the same as always, but on the whole there is less unemployment in Canada to-day than in any other country in the world and the prospects for the future are the brightest. Our natural resources are almost untouched, but are just coming into prominence.

It may not be generally known that Canada produces one-third of the silver which is produced in the world, and that Canada has the biggest gold mine in North America. Canada produces practically all of the nickel and asbestos of the world. Our copper mines are among the greatest in the world and will, before many years, be doing an enormous lot towards supplying the world with copper. Our coal mines are almost limitless. Both in the east and in the west we have enormous deposits, but strange as it may be we have never been able to locate coal in paying quantities in the Province of Ontario. We are, however, locating some vast oil deposits which are promising, and we have what are considered the second largest water power possibilities in the world. Who has the first, we are not prepared to say unless it takes in the rest of the world.

We could not expect to have everything the best, but all told we have a satisfactory share and we have the advantage that we are just entering into a period from which others are emerging or have long since left behind. Or in other words we are just about to enjoy the natural opportunities which other nations have practically exhausted.

But along with our splendid opportunities and our prosperity we are faced with the same drawbacks which confront other countries and which are apt to undermine our chances. There seems to be a universal ill-will between employer and employee which should not exist. Each thinks that the other is trying to get the best of him. The employer insists that wages must come down if he is going to compete with other countries, while the workman insists that unless living costs come down the wages must remain as they are or go higher, and with these opposing views there is the ever-present risk of strife as soon as conditions liven up a little. Both are right as far as their arguments go, but where is the remedy? The whole thing is in the cost of living. There is no possible excuse for living expenses being what they are. The cost of foodstuff is almost the same as when the war was raging and everybody had lots of money coming in.

Many articles of food bring less wholesale to-day than at any time in their history, yet look at the retail price. Take for instance, rice. Most people imagine that rice comes from China. Perhaps some of it does, but as a matter of fact the highest grade of rice comes from the State of Texas and it sells in Texas for three cents a pound. To bring it to Toronto the price is almost doubled. There is a long freight haul and duty to be paid besides the exchange which brings it up to about five and three-quarters cents per pound. This is approximately what the wholesaler has to pay for rice laid down in his storehouse. He has one and a quarter cents profit by selling it at seven cents a pound and then the retailer has to have a profit for his trouble. But just ask the price of rice at the grocery and see what the groceryman considers a fair profit. Ten or eleven cents would seem like a pretty stiff profit on a seven cent investment.

We know the merchant was caught with high priced stock on his hands, but few of them carry stock enough to last for the rest of the year and the merchant who has any of this class of stock should get up a sale and dispose of it and buy at current prices and sell at a reasonable profit, thus giving the consumer a chance to pay his way. There is nothing which will bring about normal conditions as quickly as for the middlemen to admit that they have made enough out of the war and quit hanging the bluff about "hardly holding their own." Canada has the brightest prospects of any nation in the world for 1921 if we avoid industrial strife and take advantage of what is looking our way.

In spite of the pessimist who is always with us, things are picking up even now. Foundrymen who had little or nothing to do a month ago report that work is coming in nicely, and in addition to this, new foundries are opening up and foundations are being laid for still more. The automobile plants

which were closed are now running about 60 per cent. of their capacity and taking on men. This helps the foundry. The mild winter naturally affected the stove and heater business but it had the redeeming feature that it kept the money in the country which would have gone out of the country to buy coal. One noticeable feature of the situation is that most manufacturers' store-houses are empty, so that what business is done hereafter will be with goods which will have to be made. We are not going to brag, but next month we intend to report (truthfully) that business is normal and all who want work will be employed.

Pig Iron Prices Compared

PIG iron is having a difficult time standing up to any supposed schedule and a determined effort seems to be under way to batter it down to $25, which would be well above the average of previous normal years. Here is the showing for a ten-year period from 1910 to 1919, taking Buffalo quotations, as that is the principal point of competition Canadians have to meet:

Year	High	Low	Average
1910	17.25	14.50	15.55
1911	14.25	13.50	13.84
1912	17.61	13.62	14.89
1913	17.25	13.07	14.87
1914	13.50	12.08	12.84
1915	17.77	12.44	13.98
1916	33.56	18.00	20.63
1917	50.64	33.39	40.41
1918	35.25	33.50	33.97
1919	39.19	27.00	30.53

Worked out, it will be seen that the average for those years is $21.16 per ton. This figure has been brought up by the inclusion of high-cost war years. Take the first six years of that period, 1910 to 1915, and it is seen that Buffalo was selling pig iron at an average of $14.38 per ton.

The war years, when the effect was felt on pig, viz., 1916-17-18, shows an average at the same point of $31.67 per ton. The quotation for Buffalo at this writing is $29.25 to $31.25 per ton, or a half-way price of $30.25 per ton.

Summarized, it gives these results:

Ten years' average, 1910 to 1919	$21.16
Six years' average, 1910 to 1915	14.38
War years' average, 1916-17-18	31.67
Present average	30.25

It is not the purpose of this article to go into the matter of costs, which have increased very largely on every hand. Nor have there been any advances made in the way or method of production that would serve to cut prices, for methods used now are to all intents and purposes the same as in the pre-war, cheap-cost years.

Soviet and Capitalist

IN January we published an editorial on this subject in which we advocated the doctrine of the working man elevating himself above the order of grouch and coming out like a real man particularly on election day and asserting himself. In reply to this we received a communication from far off California which reads: "The real trouble with those who say that Bolshevism will not work is the fear that it will work and that they will have to do likewise, which would be terrible to contemplate."

Now a paragraph like this, while amusing, tells quite a story in a few words. If Bolshevism works the capitalist will have to work also.

All the capitalists we ever happened to know were workers or they would not have been capitalists, but undoubtedly this argument would not hold good in every land. In a recent dispatch from Amsterdam we learn that 8,000 of the 10,000 diamond cutters formerly employed in that city are idle, chiefly on account of the collapse of Russia as a market. Before the war neither aristocratic Britain or extravagant America were to be compared with Russia as a market for diamonds. Who, in Russia, bought the diamonds when the majority of the population were in poverty?

While the Russian capitalist may have been legally entitled to his wealth, jealousy is the rage of man and he will not be wanting on the day of vengeance (so sayeth the Scripture). It would have been better for the Russian aristocracy if they had not held the peasantry and working class generally in such disdain, and better for Russia as a nation if all the factions had hung together, but this has no bearing on conditions in Canada or the United States. For a land where free schools and free libraries are at the disposal of everyone, there is no excuse for ignorance, and if the working man feels that he has the ability to govern the country after the capitalists are dispensed with why does he not come out in competition with them while they are with us? If the working man is jealous of his own kind and prefers to elect lawyers and doctors to represent him in Parliament he should not grouch. If Soviets can get elected in sufficient numbers to govern we will have to accept them but if they prefer to govern without being bothered with elections we can not consider them.

There are very few working men who want anything but what is right, and very few who want to take an active part in the government of the country, but nobody can blame them if they take a bigger interest in such matters and become more active. Everybody should take an interest in good Government and use his best judgment in coming to decisions, but should not encourage the use of incendiary or revolutionary talk.

The Value of a Technical Paper

OF what value is a mechanical paper to a mechanic, or for that matter to the foreman or superintendent? Questions like this might be asked, and might not be any too easy to satisfactorily answer without a little preparation, but there is an answer.

A mechanical or technical newspaper is invaluable to any man who follows any part of the work. If a man works in a foundry he should read a foundry paper. Such remarks as: "I served my apprenticeship," "I can learn all I want to know about the foundry without reading about it," "Takes practical experience not book learning to make a workman," have little weight. Nobody should expect to learn a trade out of a paper, but there are other things besides learning a trade. A returned soldier does not read the military papers with a view to taking part in the next war. He reads them because he is a soldier and he wants to keep in touch with other soldiers and their doings, etc. A foundryman should want to keep acquainted with what other foundrymen are doing. If he is a moulder he should read every article on moulding which appears in the paper, and he should follow it from first to last and see if he can picture himself making the mould. If he comes to a gap which he can not bridge he should consider it his duty to himself to write to the editor and demand an explanation. He should also read the advertisements in every issue and see if anything new is coming on the market. He should not encourage the thought that improved methods are his enemies, but if he looks at things in that light, it would be well to keep himself posted on how many enemies he really has. None of us know any too much and we should use the technical paper as a medium through which to exchange views. All things considered, we are bound to say that no man should work at a trade which he does not like, and if a man is following up foundry work as a laborer, a mechanic, superintendent, manager or owner, he should endeavor to improve his knowledge along these lines, and there is no better way than to study what others say on the subject and occasionally send in a suggestion or ask a question. The man who does not read the papers which are published in connection with his calling is certainly not enthusiastic about being a success.

Scraps *from* The Foundry Scrap Pile

New Foundry for St. Croix.—J. H. Laroche, of St. Croix, Lotbiniere county, P.Q., announces that he will begin at once the erection of a new foundry to replace the one destroyed by fire a short time ago. The new structure will be built of cement blocks throughout and will be modern in every respect.

The Philadelphia Foundrymen's Association, one of the oldest organizations of its kind in the world, announce that Frank Hodson, president of the Electric Furnace Construction Co., of Philadelphia, has been elected member of the executive committee of the aforesaid company.

Taylor and Arnold Engineering Works, Limited, Montreal, P.Q., whose foundry was destroyed by fire last fall, are proceeding rapidly with their new building, which is being equipped with the most modern and up-to-date appliances for the production of their castings. It is their intention to be producing castings within a few weeks.

The Tuttle & Bailey Mfg. Co. of Canada, Limited, who have a plant at Bridgeburg, Ont., for the manufacture of registers, ventilators, grills and screens, but who have so far bought their castings, will begin this spring the erection of a new foundry equipped with all the necessary appliances for the production of the class of castings required in their line of work.

T. McAvity & Sons, Limited, St. John, New Brunswick, manufacturers of plumbers, steamfitters, and engineers' supplies, in both brass and iron, are seriously considering the manufacture of cast iron water pipe and specials, in addition to their present lines. Inasmuch as this is a line which accompanies their present line, it is understood that the new venture will be an assured fact.

The Robert Mitchell Company, Limited, 64 Belair St., Montreal, who have been making heavy castings in their foundry for the last five years, have made some new installations in their plant during the last year and are now operating on a new basis and specializing in a jobbing shop business in high-grade, light, soft grey-iron castings. Amongst the improvements in their plants is the installation of seven Arcade air squeezers and an overhead trolley system.

The Huron Specialty Casting Company, which has been temporarily located at Clinton, Ont., since last June, are constructing a new modern foundry at Goderich, Ont., which will be ready for occupancy in the near future. It will be a structure of 40 x 200 feet and will have a capacity as far as floor space goes for about fifteen molders. The company consists of John Aitkin, Frank Phalin, Reginald Burrows and James Phalen; the first two being manager and assistant manager, respectively. The company make a specialty of general jobbing in high-grade gray-iron castings.

The Hill & Griffiths Co., manufacturers of foundry facings and equipment, platers, polishers and foundry supplies, Cincinnati, Ohio, announce that E. V. Brown, who for eighteen years was employed as draftsman and designer with the Whiting Foundry & Equipment Co., of Harvey, Illinois, and who also spent two years as designer with the Municipal Engineering & Contracting Co., manufacturers of excavators, trench and dredging machinery, has become associated with their company in the capacity of resident manager of their Chicago branch warehouse located at No. 3900 South Union Avenue.

Dominion Motor Castings, Limited, is a new concern which has opened up a foundry business in Windsor, Ont. The first heat was run off on February 22 and was a decided success. The foundry has a molding floor of about twenty thousand square feet, and the cupola capacity is thirty-five tons of grey iron castings per day. The equipment is of the most improved type and includes several Osborne molding machines, Preston sand sifters, McDougall tumbling mills, Sterling emery grinders, etc. More equipment will be installed shortly. The plant is designed primarily for high production rather than for doing jobbing work, but at the present time some jobbing is being done. A. Morrell, formerly of the Windsor Machine Co., is president, while R. P. Marintette is vice-president and C. A. Ripley is secretary-treasurer.

Death of J. N. Tallman: Joseph Nelson Tallman, well known brass manufacturer and president of the Tallman Brass and Metal, Ltd., Hamilton, Ont., died at St. Joseph's Hospital. Mr. Tallman had been in poor health for some time past but the news of his death will come as a shock to a wide circle of friends. He was born in Hamilton 73 years ago and had resided there practically all his life. In 1896 he purchased the brass business of William Hunter and since then has continued to extend his business until the large modern plant on the corner of Sanford Avenue and William Street is the result. In business circles deceased was well known and he took a very active and prominent part in the management of the business until his last illness. He is survived by his widow, two sons and three daughters.

Catalogues

Edgar E. Brosius, Pittsburg, Pa., is distributing some interesting literature on single-hook grab buckets. The illustrations show the Brosius grab bucket handling material of almost every conceivable description, including ashes and cinders out of some roundhouse pits, taking cinders away from blast furnace, loading cars with coal and gravel. The iron and steel foundries are also included. One device known as the skull cracker has a ball attachment for breaking ladle skulls and salamanders before loading into cars. They are also shown digging pits, filling pits, etc.

Machinery & Foundries, Limited, who have just recently opened up business at Brockville, Ont., are distributing a neat catalogue describing and illustrating the goods which they are putting on the market. These include a full line of pumps such as cistern pumps, anti-freezing well pumps, semi-rotary wing force pumps, double acting "Thresher" force pumps and pump jacks. They also show a line of hardware including clothesline pulleys, hayfork pulleys, screw pulleys, axle pulleys, well wheels, spring hinges, blind hinges, grindstone fixtures, post mauls, stovepipe dampers, stove lid lifters, adjustable fire backs, hollow ware, cauldrons, pancake griddles, waffle irons, etc.

Tempering Sand in Malleable Foundries is the title of a neat catalogue issued by the American Foundry Equipment Co., 366 Madison Ave., New York City. The contents treat on the subject of sand cutting by machines manufactured by this company, but the main feature is an illustrated and descriptive re-

view of the cycle of operations at one particular plant, i.e., the Chain Belt Company, Milwaukee, Wis. The contention is that though the malleable shops were not the first to use the sand cutting machine, they are at the present time among the foremost users, both in numbers and in the degree of profitable service derived from it. In order to show its utility in this class of work the entire programme of a day's work in this foundry is shown.

B. H. Sturtevant Company of Canada, Limited, Galt, Ont., are distributing two interesting catalogues. Catalogue No. 57 treats on their positive pressure blower, while number 265 treats on their fans. All the internal mechanism of each is shown in the various illustrations. The charts and tables which are included explain the size of machine best adapted for each size of cupola; also size of wind pipe, amount of pressure, etc. In addition to the blowers made by the company the books make mention of the other lines which the company manufactures, which include engines suitable for driving blowers; also electric motors for the same purpose. Other information, such as governing and innumerable features of equal importance, are described in a thorough manner.

P. H. and F. M. Roots Company, manufacturers of blowers, gas pumps, water pumps and vacuum pumps, Connersville, Indiana, have just issued a 48-page catalogue, illustrated and descriptive of their various types of machines. Two interior views of their plant are shown, giving the reader an opportunity of seeing the different parts of the blowers being machined and assembled. The illustrations show different installations, such as blowers connected to gas burners, oil-burners, steel converters, pneumatic machinery, etc. The reading matter describes and explains practically every question which the user could ask. The necessary tables of sizes, pressures and capacities are included. Non-vibrating valves, flexible couplings, and other accessories are shown in detail.

Book Review

Foundry Molding Machines and Pattern Equipment is the title of a new book by Edwin S. Earman, M.E., president of the American Society of Mechanical Engineers and formerly president of the Cleveland Engineering Society. It is a book of 225 pages with 70 illustrations. Mr. Earman, the author, is a man who has had a large part in developing the molding machine, and has designed a great number of machines himself. He has gathered data from foundries all over the country including every class of work being done on each type of machine and by co-ordinating all the information, assigning to each subject space in accordance with its importance, he has constructed this practical book. It has many valuable illustrations with drawings to illustrate the method of mounting patterns and making the molds by machine power. All the different types of molding machines are explained, together with the pattern and flask equipment necessary for their use, in such a way as to give the reader information in regard to machine molding that will be of value to him in any line of engineering work in the foundry. The practical foundryman will have light shed on that most important question "Will it be profitable to run this on a molding machine, and, if so, on what type of machine?"

The book is intended for the foundryman and the foundry student whether located in the foundry or in the educational institution, and the pattern maker who is interested in making patterns for machine molding. The language is simple and the ideas presented are modern and complete.

Contents

General Molding Principles.
The Theory of Jolt Ramming.
Roll Over Jolt Molding Machines.
Roll Over Jolt Molding Machine for Large Size Molds.
Roll Over Jolt Machine for Medium Size Molds.
Roll Over Jolt Machines for Small Size Molds.
Jolt Molding Machines in Brass and Aluminum Foundries.
Plain Jolt Molding Machines.
Air Operated Squeezer Machines.
Jolt Stripper Molding Machines.
Pattern Equipment.
Flask Equipment.
Machine Molded Cores.
Foundations for Jolt Ramming Molding Machines.
Index.

Published by the Penton Publishing Co., Cleveland, Ohio. Postpaid, $5.

BLOWER IS TOO SMALL

Editor Canadian Foundryman.—I have a cupola which was built by a former owner of my shop. It is a 48-inch shell lined with 6-inch cupola block, making it 36 inches inside the lining when new, but, of course, slightly more than this after first few heats. The pipe leading from the blower is 12 in. diameter until within a few feet of the cupola, when it branches into four pipes 5 in. diam. These are not crosswise of the main pipe, but are continuations gradually curving into the proper position to connect with the wind belt at four equally divided points. The wind belt is 10 inches square. Originally the cupola was provided with 4 tuyeres 4 x 8 inches. These I reinforced with four more of the same size in the hope of increasing the speed of melting, but it had no effect for better or for worse. The blower is a No. 4 Sturtevant in good condition. Everything in connection with the furnace is in good condition, but for some reason I can not make it melt more than two tons per hour, which is not half what it should do. Can you advise me what to do?

Answer.—From your description of your cupola I am convinced that you have a cupola which comes up to the required standard, but your blower is too small. Even though as good as new, a No. 4 Sturtevant fan will not supply the amount of air required for a 36-inch cupola, and I am surprised that it was ever installed, as the manufacturers do not claim for it that it will handle that sized cupola. A blower of the size of a No. 4 Sturtevant would require to run at a speed approximately 3,500 revolutions per minute in order to deliver a sufficient volume of air for a 36-inch cupola, and this speed is greater than can be recommended, as it would be next to impossible to keep the belts in order, and belts kept at a sufficient tension would add greatly to the horse power required to drive it. You would be money in pocket to get a new and larger blower at once. Your cupola should melt between four and five tons per hour if given a chance, and if you are only melting two tons per hour the amount of extra wages you are paying for wasted time will more than pay for the new one in one season, to say nothing of the improved quality of the castings, when the iron is properly melted. There is nothing more trying on the men than a heat which drags.

NOT THE WORKING MAN'S FAULT

Editor Canadian Foundryman: — In your January issue you published an article taken from Iron Age which said in part: "During the war period union labor, by striking and by resort to other methods, took advantage of its opportunity not only to advance wages and reduce hours of labor but also to extend union organization, even in the face of mutual pledges of employers and union leaders to maintain the pre-war status of closed and open shops."

Now as a union molder I don't think that letter reads just as it should. I know that certain union men have said and done many things which would have been better left alone, but why spot union labor any more than the manufacturer, the farmer or the middle man who does nothing for his money?

When wheat sold at from 75 to 90 cents per bushel the farmer argued that if he could depend on getting $1 per bushel he could see some encouragement in farming. When the war broke out and farmers in some of the countries were taken from the farm, leaving the crops to go to waste, this did not add anything to the expense of raising a bushel of wheat in Canada, but it made a bigger demand for Canadian wheat, and, as a consequence, up went the price of wheat. This was considered all right. Everybody considered that this was the farmer's opportunity to pay off his mort-

gages and get an automobile and raise himself up to the status of country gentleman. He got away with it and stands higher in the public estimation as a consequence.

The professional men also did well as a result of the war. The lawyer and the doctor changed their fees so that a service which formerly was rendered for $5 now yields them $25. The manufacturer probably did not make the big hauls which some people think he did, but still he did not do so bad. His business flourished all the year round without any effort on his part. He did not have to hire agents to hunt up work and he did not have to advertise, neither did he have to introduce those little underhand cuts in order to get contracts away from his opponents, so it is safe to say that the saving entailed by these various means more than counterbalanced any additional wages which he paid to the men. From this I argue that any price which he got over and above the ordinary pre-war price was profit.

Of course, as the war progressed and the shortage of material got more acute the prices of raw material for the manufacturer, which is in turn the finished product of some other manufacturer, was raised to an outrageous height, but the working man, organized or otherwise, did not get this. He got a few cents here and there, while prices were being increased by dollars.

Now what part did we—the working men—play in this graft game? We had to live and keep our families. We had to buy bread. We could not buy a loaf of bread for five cents or eight loaves for a quarter as we could previously. We had to pay fifteen cents for one loaf, and where were we to get the fifteen cents? The employer would not make it up to us, as he claimed it was not his fault that bread was fifteen cents a loaf. It certainly was not ours either, and as we either had to do without food or else get money enough to pay for it, we were forced to make demands upon our employer, accompanied with threats of a strike if our demands were not met. We did not want trouble and were not taking advantage of anyone, but were doing the only thing we could do.

The only thing we did which could be looked upon as a hold-up was demanding the eight-hour day. We were entitled to an eight-hour day and had been agitating for it for generations but could never get it. The war gave us the chance and we availed ourselves of it. We were prepared to work twenty-four hours a day, if necessary to win the war, but we insisted on eight hours being the day and the balance being overtime. A working man appreciates life just as much as anyone else does and he should not be expected to be a slave so that others could have comfort. We only want what is right, and since the present quiet time has been with us the eight-hour day gives more employment than the ten-hour day would, and it allows the working man a little more time to enjoy life. It is possible that wages will go back to old levels, but the working man is not unjust in demanding that living expenses take the lead on the downward course. Trusting that I have not transgressed unduly.

Union Molder.

HAS NO USE FOR UNITED STATES STEEL CORPORATION

In reading the January Canadian Foundryman the first article to take my eye was the one on the United States Steel Corporation, in which you mention that there are 90,952 shareholders distributed amongst the rank and file of the population. It gives a mistaken impression to those on the outside, for this reason: The large number of holders of common stock are on the payrolls of the various companies. I was one of them at one time. Ownership is virtually compulsory to a small extent, but the total of the holdings of this class of shareholder will never be enough to have any voice in the control of the corporation. Other concerns have similar plans, but this sort of holding is not for the benefit of the holder, but for the benefit of the company. By compelling each employee to be a partner in the business and then paying him a very small dividend, he is led to believe that the company is working on a very small margin, and that it would be useless to expect any bigger rate of pay. There are two sets of shares, 51 per cent. are in one set and 49 per cent. in the other. Very few of the 90,952 shareholders will be found in the ranks of the 51 per cent. bunch. If there happens to be a good season and the directorate decide to vote themselves a few extra millions there will be 49 nays and 51 yeas, and the majority rules. The 49 per cent. will still have the honor of holding the common stock while 51 per cent. get the cash.—One of Them.

POWDERED COAL COMPANY INCREASES CAPITALIZATION

Grindle Fuel Equipment Company will be the name of the Powdered Coal Co., formerly known as Combustion Economy Corporation.

The capital stock has been increased to $1,000,000 in Illinois, and the company is having plans prepared for building a manufacturing and demonstrating plant, to consist of a foundry, machine and sheet metal shop, office and engineering department, a complete powdered coal preparation plant, and other departments necessary for the manufacture of powdered coal equipment.

The complete plant will utilize powdered coal for fuel, and conveying system and firing equipment of the company's manufacture will be installed.

In addition to the company's need for a plant of this kind to take care of the increasing amount of business which is being secured, it is believed that the demonstrating part of the plant will be of great benefit, both to the company for sales purposes and to prospective buyers of powdered coal equipment, in order that they may see exactly what the equipment will do before contracting for an installation.

The plant will be open to the engineers and officials of prospective customers in order that they may check results obtained with powdered coal.

It is expected that this plant will be located within the city of Chicago, and it is hoped that it will be ready for operation the latter part of this year.

DECREASE SHOWN IN NET INCOME

Annual Meeting of Canada Foundries and Forgings Held At Brockville

The annual meeting of Canada Foundries and Forgings, Ltd., was held at Brockville on February 22, and several changes were made in the personnel of the directorate, among which are several new names. A heavy decrease in net income in 1920 was shown in the statement submitted to the shareholders. After allowing the usual deductions, including bond interest and other miscellaneous expenses, but before the payment of 7 per cent. dividends on the preferred stock there remained a balance of $90,861. The balance available for application to preferred dividend requirement was equivalent to approximately 8.6 on the $960,000 of senior securities of the company outstanding. After disbursing the full year's dividends on the preferred there remained the amount of $15,053 to apply on the common, or equal to about 1½ per cent. against 10.7 in 1919, some 4 per cent. in 1918 and 54 in 1917.

Among the changes in the executive of the enterprise is noted the return of W. M. Weir, as president, succeeding T. J. Dillon, whose resignation was announced a short time ago. Mr. Weir retired from the position of president last year, but remained on the board. The board now stands as follows: Wm. M. Weir, president; Hon. George P. Graham, vice-president; Hon. W. J. Shaughnessy, Montreal; Lt.-Col. C. M. Monserrat, Ottawa; W. T. Sampson, Gananoque; Lt.-Col. C. W. McLean, W. D. Robb and B. F. Conway, Montreal; James Arnold, general manager, Brockville; and J. H. Briggs, Brockville, the latter being also secretary-treasurer.

London Concrete Machinery Co., Ltd. Incorporators: Henry Pocock and John Charles Doidge, manufacturers; and and others, all of London. Capital $500,000, divided into 5,000 shares of $100 each. Chief place of business London.

Best Quality Facings
—*Low in Price*

In buying Hamilton Facings you get quality —you pay no duty—you avoid the trouble and delays at the customs which go hand in hand with imported makes—you get prompt deliveries, and—you help Canada by keeping your money in the country.

Climax Silver Lead

We have many customers who tell us that this facing is the equal, if not the superior, of those extremely high-priced leads which are being offered the foundryman daily.

Climax Silver Lead is for medium and lighter grades of castings. It will brush on the mold. It is sold at a moderate price and invariably proves its worth at the first trial.

Imperial Plumbago

Having been in constant use for thirty years among foundrymen making stove plate and ornamental work, it has naturally become a household word. If you are not already acquainted with its merit, give it a trial.

30 Years'
Experience As Canadian Manufacturers

It is obvious that thirty years' experience is bound to place a firm in an excellent position to manufacture high-grade products at low prices.

We are able to make advantageous purchases of raw materials which would be impossible were it not for our experience.

We have also learned thoroughly those manufacturing secrets without which no firm can keep its products uniform.

Consider carefully facings before buying. Remember that, "thoughtful expenditure is wise economy."

All Hamilton Foundry Supplies are, of course, fully guaranteed.

The Hamilton Facing Mill Co., Limited

Head Office and Mills

Hamilton, Ontario, Canada

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$26.00
Lake Superior charcoal, Chicago	40.50
Standard low phosphorous, Phila.	31.50
Basic, Valley furnace	26.00
Bessemer, Pittsburgh	28.96

Canadian Foundry Pig—

	Mont.	Tor.
No. 1	$39.25	$39.25

NEW METALS

	Mont.	Tor.
Lake copper	$19.00	$19.50
Electro copper	18.50	19.00
Casting copper	18.00	19.00
Tin	44.00	46.00
Zinc	8.50	9.00
Lead	7.50	8.00
Antimony	8.00	9.00
Aluminum	34.00	35.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$10.50	$ 9.00
Copper, crucible	13.00	11.00
Copper, heavy	12.00	11.00
Copper, wire	12.00	11.00
No. 1 mach. comp.	11.00	9.75
New brass cuttings	7.00	8.00
Red brass cuttings	8.00	8.00
Yellow brass cuttings	7.00	6.00
Light brass	5.00	5.00
Medium brass	6.50	6.00
Scrap zinc	4.50	4.00
Heavy lead	4.50	4.00
Tea lead	2.50	2.00
Aluminum	10.00	10.00
	Per gross ton	
Heavy melting steel	$14.00	$14.00
Boiler plate	11.00	12.00
Axles (wrought iron)	25.00	20.00
Rails	15.00	14.00
Malleable scrap	20.00	20.00
No. 1 mach. cast iron	30.00	25.00
Pipe, wrought	8.50	8.00
Car wheels	30.00	25.00
Steel axles	20.00	18.00
Machine shop turnings	8.00	6.00
Stove plate	23.00	20.00
Cast borings	8.00	7.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¾
Acid, nitric	.10
Acid, sulphuric	.03¾
Ammonia, aqua	.15¾
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.16
Copper, carbonate, anhy.	.35
Copper, sulphate	.10
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.16
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite, per cwt.	6.50
Sodium phosphate	.15
Tin Chloride	.80
Zinc Chloride C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.50
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.08¾
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09½
Crocus composition	.12
Emery composition	.10
Rouge, silver	.64
Rouge, powder, nickel	.38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$35.00	$37.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	40.00	44.00
Copper sheet, tinned, 14x 60, 14-oz.	43.00	46.00
Copper sheet, planished, 16 oz. base	47.00	50.00
Braziers', in sheets, 6x4 base	39.00	42.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$10.50	$14.50
Sheets, 3½ lbs. sq. ft.	10.25	14.00
Sheets, 4 to 6 lbs. sq. ft.	10.00	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 7.50	$ 7.50
Sheets, black, No. 10	6.50	6.50
Can. plates, dull, 53 sheets	13.00	13.00
Can. plates, all bright	14.00	14.00
Queen's Head, 28 B.W.G.	13.50	....
Fleur-de-Lis, 28 B.W.G.	12.50	....
Zinc sheets	16.50	20.00

PITTSBURG, March 3.—The finished steel market continues stagnant. There is scarcely any inquiry and thus the mills cannot get much business and do not even have much opportunity to endeavor to get business by making further price cuts. The position of most independent mills is that they would gladly quote lower prices than have yet been named if thereby they could secure reasonable sized orders and by the term they do not mean really large orders, but rather orders for say 1,000 tons at a time in the heavy rolled products and even less in the lighter materials, like sheets.

In sheets there are definitely lower prices. Blue annealed sheets are still quotable at 3.20c against the Industrial Board price of 3.55c, but the 3.20c is practically nominal, awaiting inquiry, and the heavy gauges can be bought at much less, as they could be bought at a plate mill price, say at 2.10c plus an extra for their being under ¼-inch thick. Black sheets can easily be done at 4.10c, against 4.15c quoted a week ago, and an Industrial Board price of 4.35c, while it is believed 4.00c could be done and perhaps shaded a trifle on a really good order. Galvanized sheets have been quoted even in small lots at 5.25c against 5.35c a week ago and an Industrial Board price of 5.70c.

Standard steel pipe seems still to present a firm front, so far as the mills are concerned, but it is reported that some jobbers, particularly in the East, are offering to sell at mill prices. Tin plate likewise has not been shaded. These two are the only lines that remain at Industrial Board prices.

The record of prices and price declines, however, is of little significance and of no particular interest. As to market conditions it does not matter what prices chance to be quotable, as there is no market in the sense of there being activity.

Buyers are taking no interest in prices. There is nothing like a deadlock. Buyers are not waiting for lower prices, nor have they any particular prices in mind, at which they would be disposed to buy.

Foundry pig iron has quietly slid off a dollar a ton, $27, valley, being now the accepted market price, Bessemer remaining at $27 and basic at $25. These prices are more or less nominal, and certainly they are not supported by any buying to speak of. The prices are much below the cost of production, based on the cost of the large quantities of ore the furnaces have, purchased at last season's prices, and recent prices for coke. It appears now that the pig iron price will make the ore and coke prices, rather than the other way, and of course furnaces have to absorb the loss on the ore already bought. There is no interest in coke as to actual purchases, and little interest as to the future, the point about coke being that eventually the Steel Corporation will no doubt reduce wages all around, including wages in the Connellsville region, and then the other operators in the region can reduce also. When the new wage scale is in force it will be possible to figure how cheaply coke can be sold. The market is nominal just now, with spot furnace at $4.50 and contracts at $5.00. Some operators ask more, of course, but even those with the lowest prices do not effect sales. Spot foundry coke is quotable at $5.50 to $6.50, depending on brand, all prices being per net ton, f.o.b. Connellsville ovens.

"Salamander" Brand

English Make

MORGAN'S CRUCIBLES

WE are offering these dependable English Crucibles at prices that are extremely reasonable. Their trademark, "Salamander," is all most foundrymen need know about their quality. They are made in Battersea, England, of a composition that wears much longer than the average.

Our customers are averaging thirty to fifty heats per pot, and at their low price they are the most economical of any make on the market. We are well stocked on practically all sizes. Special sizes made to order for oil, gas, or coke fuel.

It is our business to supply equipment for every foundry purpose. We handle the lines of best known manufacturers and make prompt shipments.

Write for full particulars.

The Dominion Foundry Supply Co., Limited

Everything for the Foundry

MONTREAL TORONTO WINNIPEG

CLASSIFIED ADVERTISEMENTS

TWO CENTS A WORD. Minimum charge is $1.00 for 50 words or less. Ads. set in border are at the card display rates.

SITUATIONS VACANT

CLEANING AND FINISHING FOREMAN FOR large malleable iron foundry in New York State, producing journal boxes and railroad castings. Must be able to handle 100 to 150 tons of castings daily—turn out work accurately finished to gauges, maintain all operations on piece work basis, and keep castings continuously moving from tumblers to shipping platform. Opportunity to become connected with a permanent and stable organization. Address Box No. 6221, Canadian Foundryman, Toronto, Ont.

WANTED — FOUR GREY IRON JOBBING moulders, two core makers; rate 90c per hour. Open shop. Apply Box 1321, Canadian Foundryman.

PATTERNS

LET US SOLVE YOUR PATTERN PROBLEMS. Wood and metal models and aluminum plate work. Write, mentioning Canadian Foundryman, to the Hamilton Pattern Works, 120 Adelaide St. W., Toronto. (crf)

WOOD AND METAL PATTERNS—OUR WORK is good and prices right. Give us a try. Write for particulars, mentioning "Canadian Foundryman," to Downer Pattern Works, 1-3 Jarvis St., Toronto.

MACHINERY WANTED

WANTED FOR CASH—WOODWORKING MAchinery of every description. Box 4121, Canadian Foundryman. (cff)

ELECTRIC MOTORS WANTED FOR CASH—Fisher Electric Co., new warehouse, 77 Front Street East, Toronto, Ont., Main 3288. (cmf)

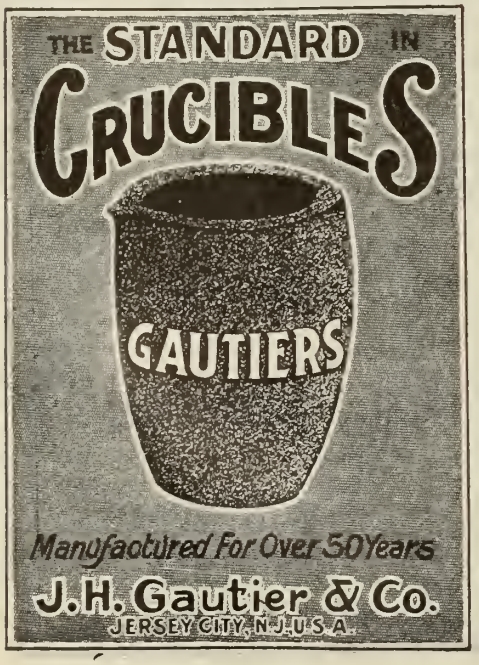
COMPLETE MANUFACTURING PLANTS PURchased outright or for disposal on contract basis. Write, mentioning "Canadian Foundryman," to the A. R. Williams Machinery Co., Toronto. (crf)

Bailey & Bell Fire Brick Co.

Manufacturers and Importers of High Grade Fire Brick, Fire Clay and General Supplies. Special Shapes, Cupola Block, Stoker Brick, Boiler Tiles, Stove and Quebec Heater Linings.

MADE IN CANADA

1347-49-51 Dufferin St., Toronto. Phone Ken. 4335



FOR SALE

PUT YOUR MATERIAL ON A SHANTZ TRUCK while moving through the shop. It will pay you. Factory trucks of all kinds and special sizes and styles to order promptly. Jobbing castings. P. E. Shantz, Preston.

FOR SALE—ONE OIL BRASS MELTING FURnace with self-contained motor, 110 volts, S.P. 60 cycles, Hawley down draft pattern; capacity four hundred pounds; in first-class order. First cheque $500. Apply to the McClure Optical & Manufacturing Reg'd., 109 St. John St., Quebec, P.Q. (c4f)

FOR SALE—AUTOMATIC ROTATING TABLES, most durable constructed table made. Write, mentioning "Canadian Foundryman," for particulars to Mussens Limited, Montreal (crf)

FOR SALE—SHOVELS, BRASS AND GALVANized Riddles, Bellows, Core Ovens, etc. Write for particulars to Box 3021, Canadian Foundryman. (cmf)

IF YOU HAVE IRONWORKING OR WOODworking machines for sale, call or write Canada's largest dealers in new and used machinery. Write, mentioning Canadian Foundryman, to H. W. Petrie Ltd., Toronto. (cff)

FOR SALE—GRAND ROTARY SAND RIDDLE. Absolutely new. Box 1021, Canadian Foundryman. (cmf)

TUMBLING, TILTING AND BURNISHING barrels for sale. Made in Canada. Box 2021, Canadian Foundryman. (cmf)

USED AND NEW WOODWORKING MACHINery, also metal lathes and small tools, belting and transmission. Write, mentioning Canadian Foundryman, to General Machinery Co., 67-69 Frederick St., Toronto. Main 2200. tf.

SAND RIDDLES—YOU CANNOT AFFORD TO be without this sand riddle. Ready for immediate shipment. Operated by electricity. This is a real bargain. Write for particulars to Box 4321, Canadian Foundryman. (cmf)

CLIMAX GREY CORE COMPOUND SAVES dollars' worth of labor. Climax Core Wash remains in suspension, will not wash, buckle or rub off, and it cleans easily. A trial will convince you. Write for samples and prices to Hamilton Facing Mill Co., Hamilton, Ont. (crf)

OPPORTUNITIES

WELL EQUIPPED FOUNDRY FOR SALE AT Brockville; excellent opportunity; sealed tenders will be received by the undersigned up to March 15th; the highest or any tender not necessarily accepted. Further particulars on application to Box 5321, Canadian Foundryman. (crf)

Canadian Pattern & Castings Co. Ltd.

49 Drouillard Road

FORD CITY, ONTARIO

Wood and Metal Production

PATTERNS

Brass, Bronze and Aluminum

CASTINGS

In Production Quantities

USES TO WHICH MALLEABLE CASTINGS CAN BE PUT

(Continued from page 29)

tion. It will be noted that the average ultimate strength is 49,358 pounds per square inch, the average elongation 10.8 per cent. in two inches, and the average transverse strength for duplicate full-sized bars, 5,955 pounds. However, the interesting point in connection with the subject we are now considering is the additional test that was made. The illustration shows that each transverse bar has been machined down to a diameter one-eighth inch less than the one immediately above it and another transverse test performed. It would seem that this is proof of the quality of the metal even at the centre of a one-inch square section.

Fig. 7 is a reproduction of three micrographs taken on a two-inch malleable iron section. One represents the metal near the outer edge, one at the centre and the third at a point midway between the others. The uniformity is clearly shown.

It has been remarked before that malleable iron in its molten state is more fluid than steel and may be poured at a lower temperature. This characteristic permits the commercial production of castings which have heavy sections, designed primarily for strength, or which have light sections and are given an intricate design to meet some particular requirement.

Fig. 8 illustrates a large and a small casting. The scale also reproduced is a measure of the size and thickness of section of the large casting. Malleable iron, as stated above, is as well adapted to such castings as to those of lighter section.

In contrast the illustration shows also a short length of detachable sprocket chain. Each link is a malleable casting, and many millions of feet are produced annually for use in the construction of agricultural and conveying machinery. The insert shows a full-sized link. These castings could be poured from grey iron, in which case they would lack strength, but could not be made commercially from cast steel and a forging would be too costly. It represents the case of a casting which must be absolutely true to pattern, must be of high tensile quality, and, at the same time resist physical wear in the bearing points and corrosion from the elements. This brings us to the discussion of Question 2 mentioned above.

Canadian Farm Power and Machinery Co., Ltd. Incorporators: Milton Ira Adolphe, farmer, Listowel, Ont.; and others. Capital $1,000,000, divided into 10,000 shares of $100 each, of which 5,000 shares shall be preference shares. Head office, Toronto.

HOLLAND PRODUCTS
Are Real Money Savers

Core Oil

Just because you have a large percentage of defective castings at every pour, don't consider this condition as necessary. Holland Core Oils will reduce your losses to a negligible quantity.

Made in five grades—Big Stick, Regular, Old Regular, Special No. 1, and Extra Fast Drying. These grades efficiently handle every phase of core making for grey iron, malleable, steel, aluminum and brass.

Holland Straight Tripoli Parting

Use nothing but the genuine article. All others are "mere make-shifts," and will always make you trouble, while Holland Straight Tripoli Parting will not only produce smooth, clean surfaces to your castings, but will go much farther because of it being so light and finely milled. Its uniformity in quality and color is a safeguard to all foundrymen. Order a barrel to-day and be convinced of our statements.

Holland Products are expressly made to reduce costs and at the same time improve the quality of the work. Why not give them a trial?

HOLLAND CORE OIL COMPANY

4600 W. HURON ST. CHICAGO, ILLINOIS

Canadian Agents:

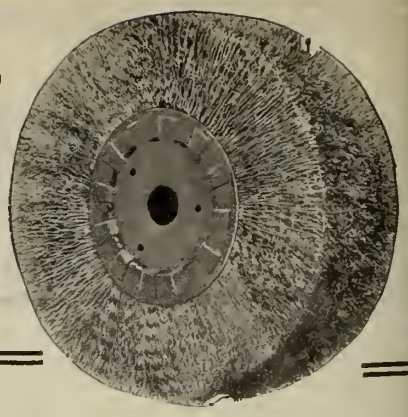
The Dominion Foundry Supply Co., Ltd.

EVERYTHING FOR THE FOUNDRY

Toronto, Ont. and Montreal, Que.

"SAMSON"

Wire Wheel Brush Sections



No Hub or Holder Required

For removing scales from hot forgings, axes, shovels and other tools; for cleaning brass castings, sheet brass and copper.

"Samson" Wire Wheel Brush Sections are made to be mounted with ease and quickness. The metal disc centre is punched to fit any size of spindle. Each section is a brush in itself, making a convenient and practical method of building a wheel any desired width of face.

A trial order will convince you that "Samson" scratch wheels are the most efficient and economical brushes you can secure. Write for catalog and full information.

The Manufacturers Brush Co., Cleveland, Ohio

111 Reade Street, New York

KELLER-MASTER

KELLER-MASTER
ROTARY GRINDER

Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.

KELLER-MADE
MASTER-BUILT

KELLER

PNEUMATIC TOOL COMPANY
GRAND HAVEN, MICHIGAN
BANK OF NOVA SCOTIA BLDG., MONTREAL

DIAMOND

MASTER FLASK

Diamond Master Flasks are light in weight, easy to handle, accurate and very durable. Their convenience and accuracy result in a larger and better production. Let your next order stipulate Diamond Master Flasks.

Sold in Canada by

Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

DIAMOND CLAMP & FLASK CO.
40 N. 14th St. RICHMOND, INDIANA

GEO. F. PETTINOS
FOUNDRY SUPPLIES
PHILADELPHIA

FOUNDRY FACINGS

Our facings are manufactured from the best qualities of Plumbago and we guarantee satisfactory results from their use in your foundry. A grade to suit your individual requirements can be furnished from our large list of standards. Every barrel shipped has back of it our 27 years' practical experience. The three leading brands are:

GEOGRAPH PLUMBAGO FACING
CEYLOGRAPH PLUMBAGO FACING
MEXIGRAPH PLUMBAGO FACING

ARMOR BLACKING AND CORE WASH

George F. Pettinos

Real Estate Trust Building - Philadelphia, Pa.

Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

IN YOUR PRODUCTION DO YOU USE
CASTINGS
FORGINGS
STAMPINGS
HEAT TREATED PARTS
SHEET
PLATE OR
STRUCTURAL
IN ANY SIZE, WEIGHT OR SHAPE?

PANGBORN SAND-BLASTS

HAVE PRODUCED IN OTHER PLANTS
BETTER QUICKER CHEAPER
CLEANING & BETTER FINISH
WITH INCREASED OUTPUT
AND LOWERED COST

AUTOMATIC · DUSTLESS · HYGIENIC
"A Type and Size for Every Requirement"

Competent Engineers To Aid In
Intelligent Selection & Application
Of Equipment Suited to Your Needs
Without Cost or Obligation

PANGBORN CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS
P. O. Box 8508

GLOBE

Shot Blasting

Instead of Sand Blasting

Ensures 100%

Cleaner Castings

Globe chilled shot leaves a perfectly smooth surface—an important factor where castings are to be enamelled—sand leaves a sand coating.

SHOT DOES NOT WEAR THE HOSE, NOZZLE OR MACHINE AS FAST AS SAND, AND IT CLEANS EASILY 100% BETTER.

Let us tell you more about it.

THE GLOBE STEEL CO.
MANSFIELD, OHIO

SLY FOUNDRY EQUIPMENT "UP - TO - DATE"

20/40 Sand Blast Mill at Olds Motor Works, Lansing, Mich.

Is the Finishing of Small Parts and Castings Costing You Too Much?

Here's a profit leak that bears close analysis. The cost of small parts may become out of proportion to the cost of larger parts unless they are finished in sufficient volume in the least possible time and with the minimum amount of labor.

Since cost depends on volume, where 6 or 8 tons a day have been cleaned by one method or another, the installation of a 30/40 Sly Sand Blast Mill actually turns out 8 to 20 tons a day and with the minimum amount of labor.

Drop forgings, stampings, small gears, auto parts, brass and bronze work and malleable iron castings that are put through a 30/40 Sly Sand Blast Mill are cleaned with the thoroughness of a sand-blasting operation that imitates hand work, lessening machining on parts that are to be machined; eliminating defective parts; giving a surface that is ready for plating.

It is your privilege to draw on over forty years' experience in the business, by putting your cleaning problem up to us. Write or wire

The W. W. SLY Mfg. Co.

New York, Washington, Birmingham — *Main Office and Works:* Cleveland, Ohio, Paris, France — Chicago, Detroit, St. Louis

Other SLY Products

Steel Tumbling Mills
Iron Cinder Mills
Brass Cinder Mills
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Sand Blast Mills
Sand Blast Mills—Tilted
Exhaust Fans
Sand Blast Rooms
Sand Blast Cabinet
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers

Berkshire Molding Machines

Reduce Molding Cost

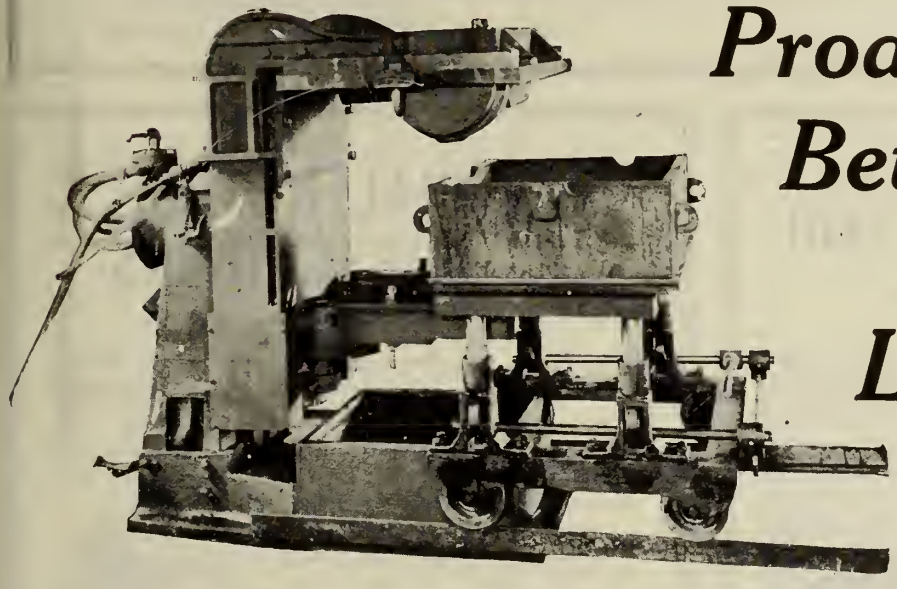
Showing a Berkshire Portable Air Squeezer with pattern-drawing device turning out molds in one of the largest foundries on the Continent. Berkshire machines will increase your production 50 to 100 per cent. and give you perfect satisfaction.

The Berkshire Mfg. Co.

Cleveland Ohio

GRIMES

JAR-RAMMED ROLL-OVER MACHINE



Produce Better Castings for Less Money

Simplicity of Design
Ease of Operation
Low Cost of Installation

No Pits to Clean
Small Floor Space Required
Entirely Above Floor Level

These features assist in making Grimes Molding Machines the best on the market.

Grimes are made in many different types in both hand and power models up to 5,000 lbs. capacity, for use on a wide variety of work.

Grimes Molding Machines have solved many a hard molding problem. Let them solve yours. Write us to-day.

GRIMES MOLDING MACHINE CO.

5738 Hastings St. **DETROIT, Mich.**

SCARFE'S No. 7
CORE OIL

SCARFE & COMPANY, LIMITED

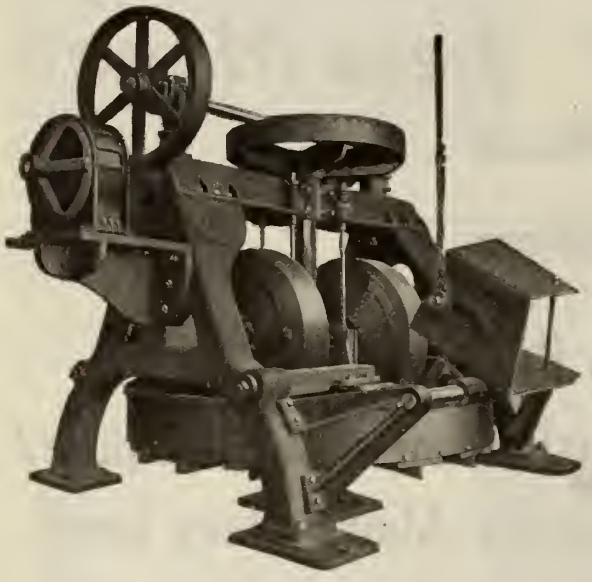
Makers of Industrial Varnishes and Paints

Head Office: BRANTFORD *Branches:* MONTREAL and WINNIPEG

Frost

Wet Pan Sand Mill

for Steel Foundries



The Frost Mfg. Co.

112 W. Adams St.
CHICAGO

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We have received some complaints from subscribers to the effect that "Canadian Foundryman" is not being delivered. In almost every case investigation has shown that our friends have changed their addresses and have NOT notified us.

Let every subscriber look at the address on the label on this issue of "Canadian Foundryman," and if it is not correct, please fill in and mail to us the following—

Name .....

Old Address .....

Change to

New Address .....

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Address : "Canadian Foundryman"
143 University Ave. Toronto, Ont.

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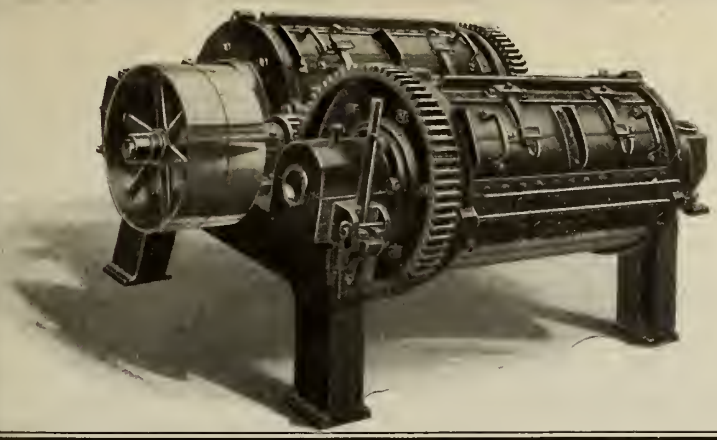
What Can We Do For You?

Here's what we have done for others:
Sold machinery and foundry equipment of all kinds.
Brought together employers requiring men to fill positions, and employees seeking positions.
What we have done for others, we can do for you.
Our classified rates are as follows:
2 cents per word, with a minimum charge of $1.00 for fifty words or less.
Secrecy is secured by using a box number, which counts as five words.
This is your department of service and we can help you if you give us the opportunity.
TRY IT!

CANADIAN FOUNDRYMAN CLASSIFIED ADVERTISEMENT SECTION
143 UNIVERSITY AVENUE, TORONTO, ONTARIO



EXHAUST TUMBLING MILLS BUILT IN DOUBLE FILE

Constructed in the same efficient manner as all other McDougall products.

Each Mill may be run separately, which proves a decided advantage when filling or emptying.

Properly protected Ring Oiling Bearing.

Guaranteed for Long, Continuous, Satisfactory Service.

THE R. McDOUGALL CO., LTD.
GALT, ONTARIO

HAUSFELD

Tilting Crucible Melting Furnace

No equipment other than piping to the gas meter and the fuel oil reservoir is necessary. The furnace can be had without the fuel oil feeder and burner if desired, but for emergency purposes, in event of failure of gas supply, the complete unit is of great advantage. Hausfeld Furnaces cut melting costs. Send for complete description.

Manufactured only by

THE CAMPBELL-HAUSFELD CO.
General Offices and Works:
HARRISON, OHIO

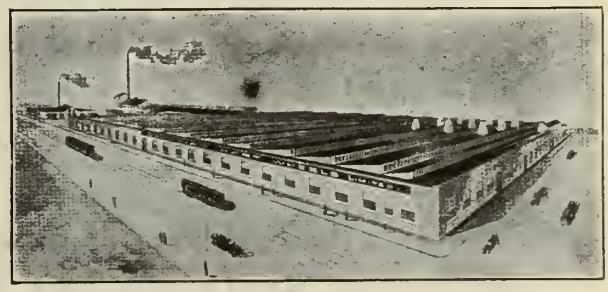
Canadian Representative
THE
E. J. WOODISON CO.
LIMITED
TORONTO, ONT.

COMPLETE UNIT
Gas or Oil

CANADIAN HART WHEELS

CUT FASTER LAST LONGER

Than any other wheels on the market



Our New Modern Plant.

EMERY WHEELS A SPECIALTY
WE SOLICIT EXPORT TRADE

Tell us the service you want performed and we will supply you with an abrasive wheel that will save you time, money and worry.

Send for one of our catalogues and tell us your troubles. We do the rest.

CANADIAN HART PRODUCTS, Limited

Successors to

Canadian Hart Wheels, Limited

HAMILTON - - - ONTARIO, CAN.

The Hawley-Schwartz Furnace

The Only Perfect Melter

All metal from 50 lbs. to 10,000 lbs.

Is Absolutely Uniform

Write for catalog and complete information

The Hawley Down Draft Furnace Co.
Easton, Penn., U.S.A.

Good Times Just Ahead

PROSPERITY is within our reach in Canada.

All we need to have and to hold it is a sane, sure grasp on its simple elements.

They are Industry, Integrity, and Faith.

These are the cardinal virtues of human relations. They are the underpinnings of healthy, natural business life and the foundation of a wholesome social system.

They are the fountainhead from which Progress springs. A well-known business economist has called them the "Fundamentals of Prosperity."

Your purchases are an expression of Faith. They are evidence of your Industry. Make them confidently from business institutions of Integrity.

Buying is the backbone of prosperity. An active market means more employment, steadier earnings; benefits are passed around.

Wise spending gives stability to earning and for that reason is far-sighted thrift and sound economy.

The call of to-day is for cheerful thinking, willing working and constructive action by you—everybody—NOW.

To-morrow's change for the better will come about through the combined efforts of each and every one of us.

By sheer force of numbers and co-operation, by the high power of heart and mind, we can put Business on a firm, stable basis.

We can do this because all of the material factors making for better business are right.

Let us link our faith with industry, our vision with courage, and forge ahead.

Let's make an uncommon effort toward a common end—Good Times.

A message from the Associated Advertising Clubs of the World.

Foundry of Holmes Foundry Company, Port Huron, Mich.
Designed by The H. M. Lane Company

Designed As a Machine

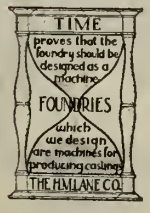
The Holmes Foundry Company's plant depicted above was designed for the production of automobile cylinder castings.

Among its many features is the straight line travel of the various items to the point where they must meet. For instance, a mold is produced at such a point that its cores move a minimum distance, its iron moves a minimum distance to it and the casting moves a minimum distance to its cleaning. An interesting feature is that all scrap automatically lands within sight of the man responsible for it, so that he has his "sin" staring him in the face.

Like all Lane-designed foundries, this plant functions as a veritable machine.

There are many foundries in the breadth and length of the land which are paying the price of poor original design and layout. In some instances it has been possible to eliminate some handicaps; in others they will remain with the plant as long as it is in existence. Our experience will enable you to avoid such errors so far as it is humanly possible.

If you are thinking of building a new foundry or an addition to your present one, get in touch with us. It will pay you.


TIME
proves that the foundry should be designed as a machine.
FOUNDRIES
which we design are machines for producing castings
THE H.M.LANE CO.

THE H. M. LANE COMPANY

Industrial Engineers and Foundry Specialists

OWEN BUILDING, DETROIT, MICH.

Canadian Office : The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.

CLEVELAND "PISTOL GRIP" CHIPPING HAMMERS

A REMARKABLE TOOL FOR FAST WORK

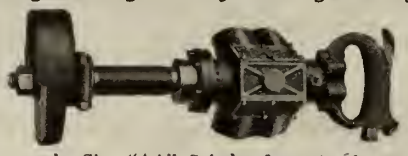
Fitted with "Outside Throttle-Lever" and with "Hexagon or Round Tool-Nose."

We also make Chipping Hammers with "Enclosed" Handles fitted with Outside or Inside Latch.

CLEVELAND PORTABLE AIR GRINDERS

For cleaning Castings or any other general grinding

SIZE NO. G. Regularly fitted with 1 in. x 6 in. Emery Wheel and Wheel Guard.
Weight 19 lbs.
Speed 3300 R.P.M.



SIZE NO. A. Not illustrated, has Twist Throttle Handle, but is otherwise the same in construction as Size "G."

We also make Size "AA" Grinder for extra heavy work.

IN STOCK: Sand Rammers, Riveting, Calking and Beading Hammers, Piston Motors, Corner Drills, Holder Ons, Angle Gears, etc.

BOWES AIR HOSE COUPLINGS AND CLECO PRESSURE SEATED AIR VALVES

ARE STANDARD EQUIPMENT EVERYWHERE

Style P.O.

Cut shows Never-slip Clamp attached to Bowes.
Bulletins 44 and 48 mailed on request.

Style A.

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED
84 Chestnut St., Toronto, Ont. 337 Craig St. West, Montreal, Que.

Thor

Pneumatic Tools

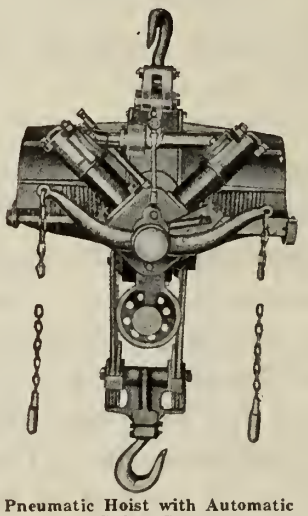
Complete for Foundry Needs

The predominance of THOR tools in the foundry field has been achieved through the constant efforts of THOR engineers to insure perfect operation under severest conditions.

THOR Pneumatic Hoist with THOR Close Quarter Drill type motor has automatic stop, insuring, at all times, simple, yet perfect, control.

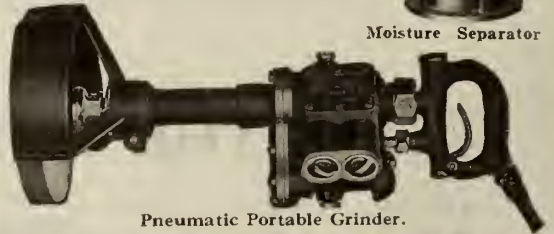
THOR Moisture Separator removes all dirt, oil and water from the air, sending only clean air into the valve chambers of Pneumatic Tools. A THOR Separator is "life insurance" for your pneumatic tools.

THOR Chippers, Bench and Floor Rammers, Drills, Riveting Hammers, and Accessories, supply tools complete for every foundry need. THOR—the name to look for—on all foundry tools.



Pneumatic Hoist with Automatic Safety Stop.

Moisture Separator



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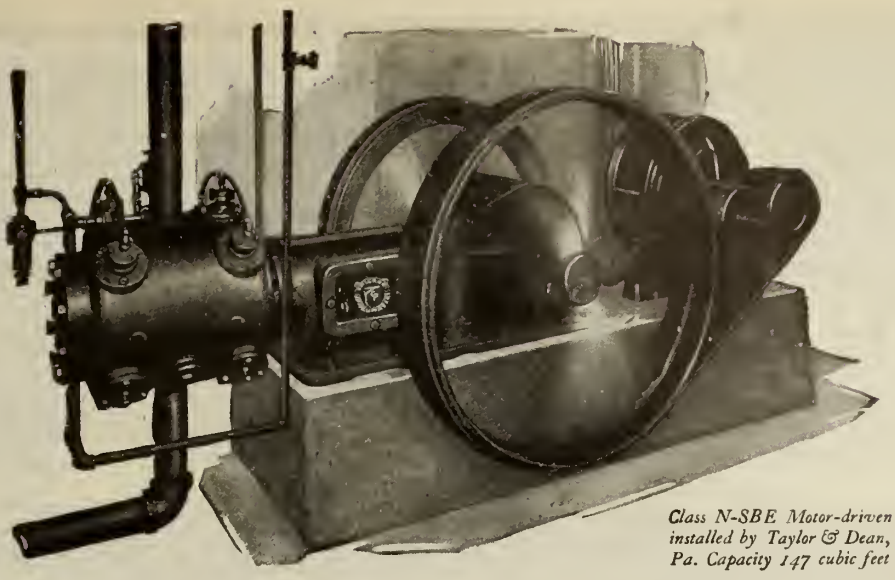

Class N-SBE Motor-driven Compressor installed by Taylor & Dean, Pittsburgh, Pa. Capacity 147 cubic feet per minute.

An ideal unit for moderate air power needs

CHICAGO Pneumatic Short-Belt Motor-Driven Air Compressors are ideal units for the small air power plant. Their compact construction economizes space. The short-belt drive with idler pulley prevents belt troubles

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C-52-H

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JOLT MACHINES AND SQUEEZERS
Grimes Molding Machine Co., Detroit, Mich.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

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Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J. Co., Toronto, Ont.

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Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

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Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J. Co., Toronto, Ont.

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Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

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Pettinos, George F., Philadelphia, Pa.

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Wadsworth Core Machine & Equip. Co., Akron, O.

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Pettinos, George F., Philadelphia, Pa.

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Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDS, GAGGER
Wadsworth Core Machine & Equip. Co. Akron, O.

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Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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The Cleveland Osborn Mfg. Co., Cleveland, O.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Hamilton Facing Mill Co., Hamilton, Ont.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND
Woodison, E. J. Co., Toronto, Ont.

MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.

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Cleveland Pneumatic Tool C.. The.

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Dom. Oxygen Co., Toronto, Ont.

NOZZLES, SAND BLAST
Frederic B. Stevens, Detroit, Mich.
Panghorn Corporation, Hagerstown, Md. U.S.A.

NORTH RIVER SAND
Pettinos, George F., Philadelphia, Pa.

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Woodison, E. J. Co., Toronto, Ont.

OILSTONE GRINDERS
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Dom. Oxygen Co., Toronto, Ont.

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National Engineering Co., Chicago, Ill.
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Hamilton Pattern Works, Toronto, Ont.
Modern Pattern & Machine Co., Ford City, Ont.

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Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machy. Co., Preaton, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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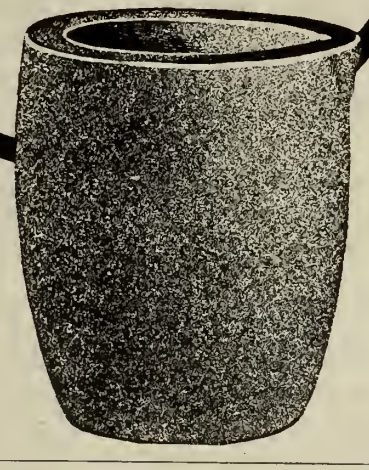

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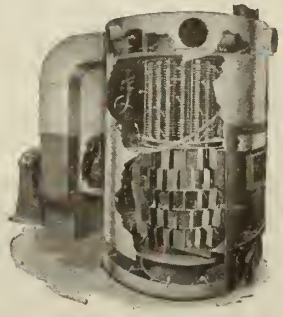

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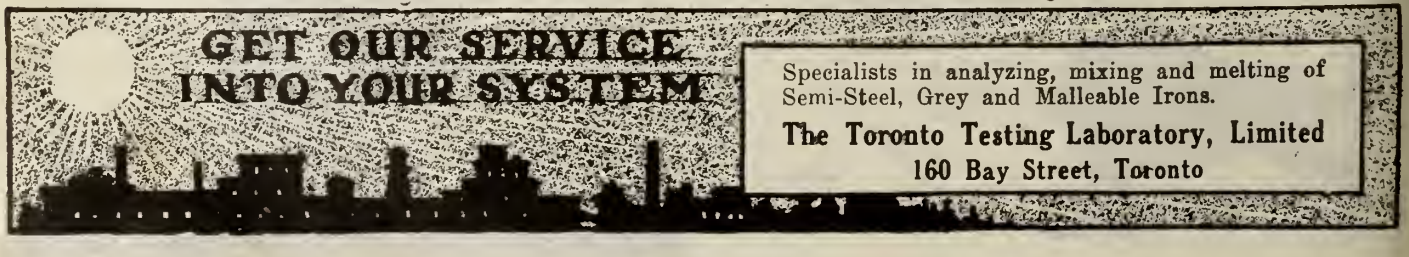
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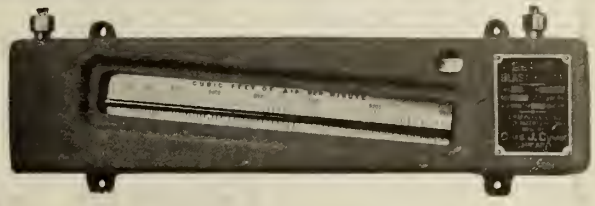

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May we send you descriptive pamphlet and full particulars?

W. W. WELLS, Toronto

In Brass Bronze Copper Nickel Tin & Zinc

Best Quality **GREY IRON** *Best Service*

CASTINGS

and Castings in

Zinc, Brass, Copper, Nickel Bronze and Aluminum

PROMPT DELIVERIES.

CANADIAN HANSON & VAN WINKLE COMPANY, LIMITED

TORONTO, CANADA

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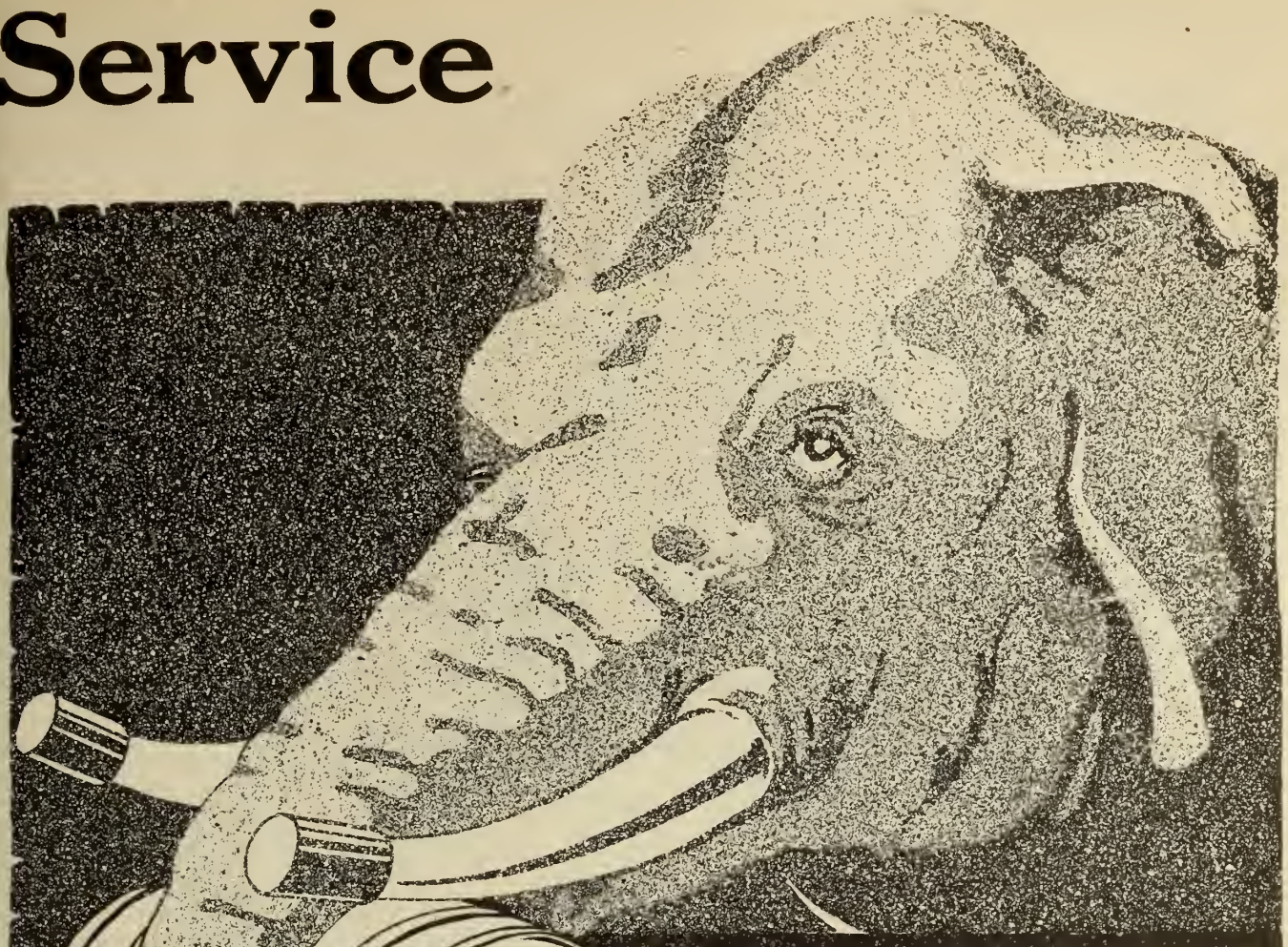

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(You buy it by weight, you use it by quantity. The greatest quantity is given for the least money)

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(They carry more metal with same effort, and one outlasts a dozen cast ladles)

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Another thing—or things—I manufacture a complete line of polishing and plating supplies, buffing lathes, buffing Compositions, etc.

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Manufacturer of Foundry, Electro-Plating and Polishing Supplies and Equipment, Cupola Blocks, Fire Brick and Clay.

Corner of Third and Larned Streets

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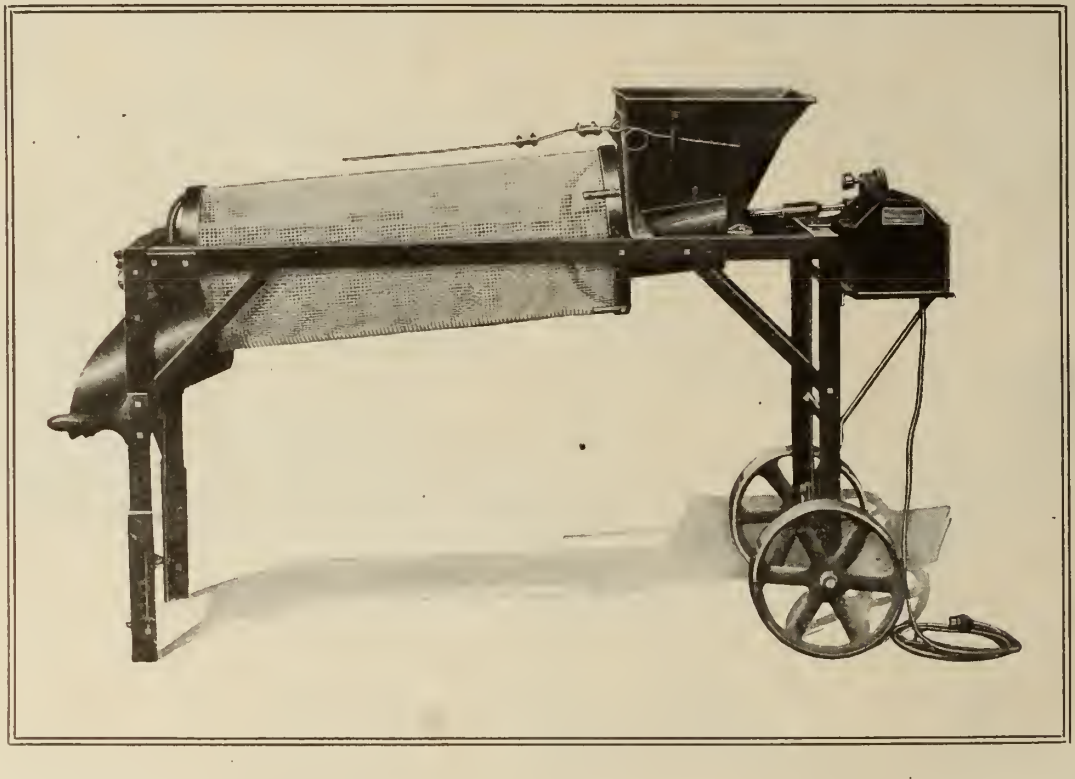
The Foundry Sch.

Will You Be Ready For The Rush?

Not Unless You Install---

THE GRAND ROTARY SAND RIDDLE



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JACKSON, MICHIGAN, U.S.A.

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

VOL. XII. PUBLICATION OFFICE, TORONTO, APRIL, 1921 No 4.

ALBANY MOLDING SAND

"THE WORLD'S BEST"

Selected and Graded for the Work Required

"By Men Who Know"

ALBANY SAND AND SUPPLY CO.

ALBANY, N.Y.

KAWIN SERVICE

A ship when coming into port takes a pilot on board. The captain realizes that no matter how great is his seamanship he does not know the ports at which he calls as well as the pilot.

So with your foundry. A foundry owner, no matter how capable, can not know **all** the branches of his foundry practice as well as men who specialize—each in his own particular branch.

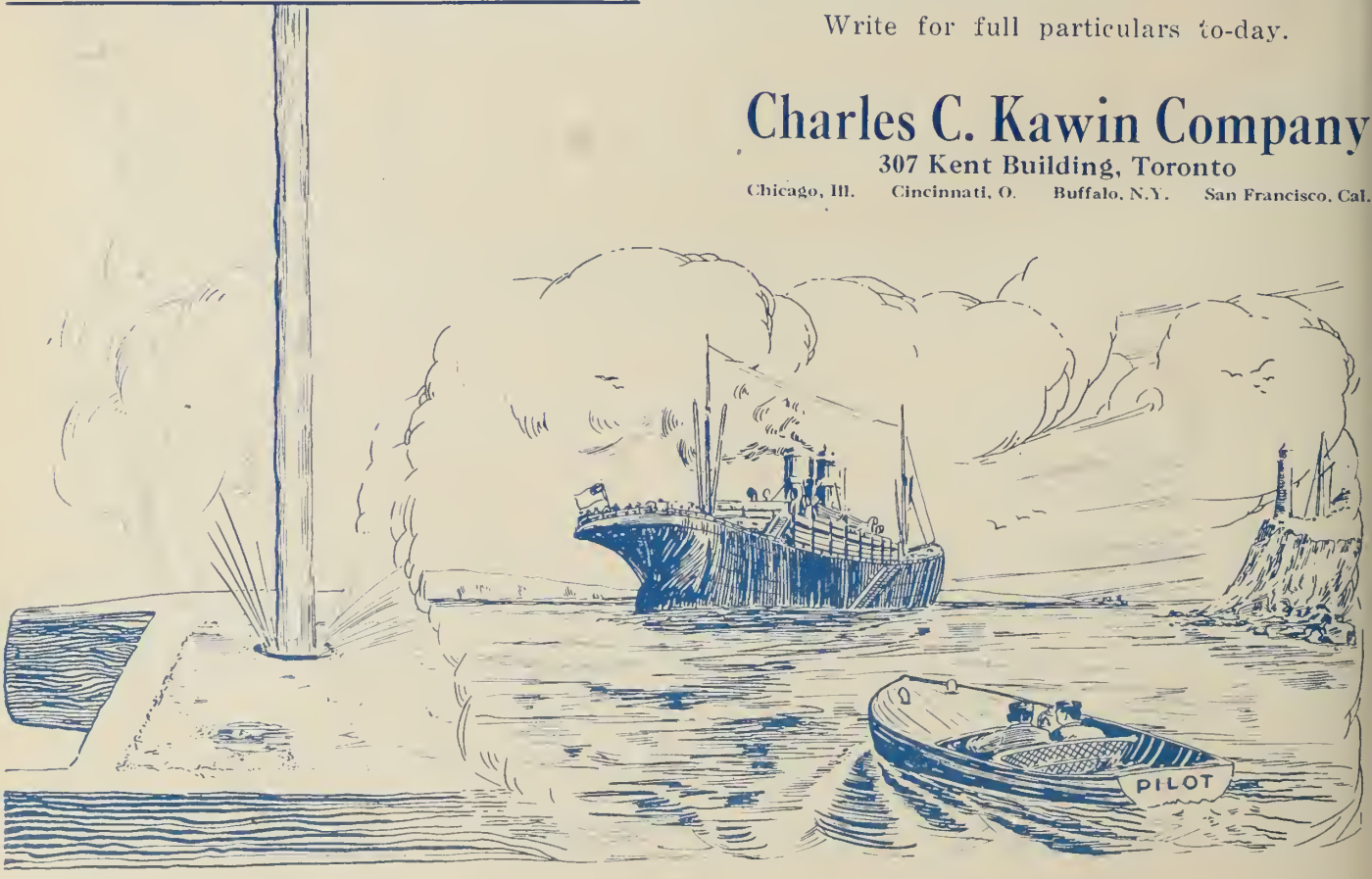
This is why Kawin Foundry Service has proved of such inestimable value to Canadian and American Foundrymen.

The Service consists of capable, highly trained men, each of whom has learned his own particular branch of foundry practice —both practical and theoretical—from the bottom to the top.

Because experience has proved just what Kawin Service can accomplish in a foundry, we are able to **guarantee that our service will save you at least 100% over and above its cost!**

Write for full particulars to-day.

Consider your foundry as a ship — and Kawin as the pilot.



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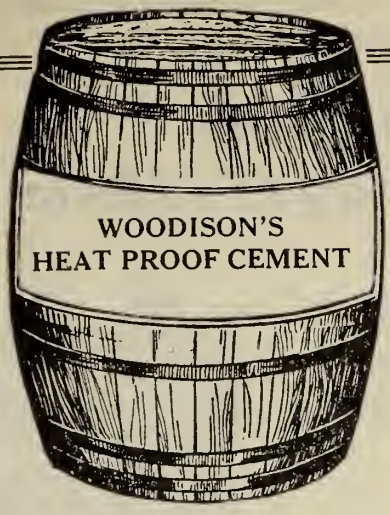
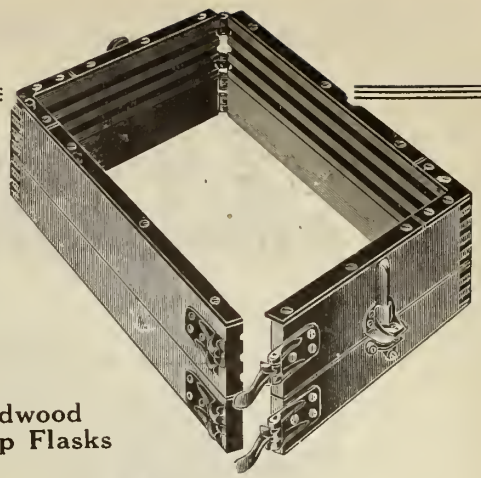
Chicago, Ill. Cincinnati, O. Buffalo, N.Y. San Francisco, Cal.





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Helping to Make Profitable Foundries

WOODISON

FOUNDRY AND MECHANICAL EQUIPMENT

Profitable Foundries depend in a great measure on the kind of equipment used. Woodison's Foundry Equipment is bringing additional profits to many Canadian Foundries. This is because every Woodison Product is sold on a **Service basis,** and this means that Woodison Equipment is made of the highest quality materials and workmanship and guaranteed to give satisfaction.

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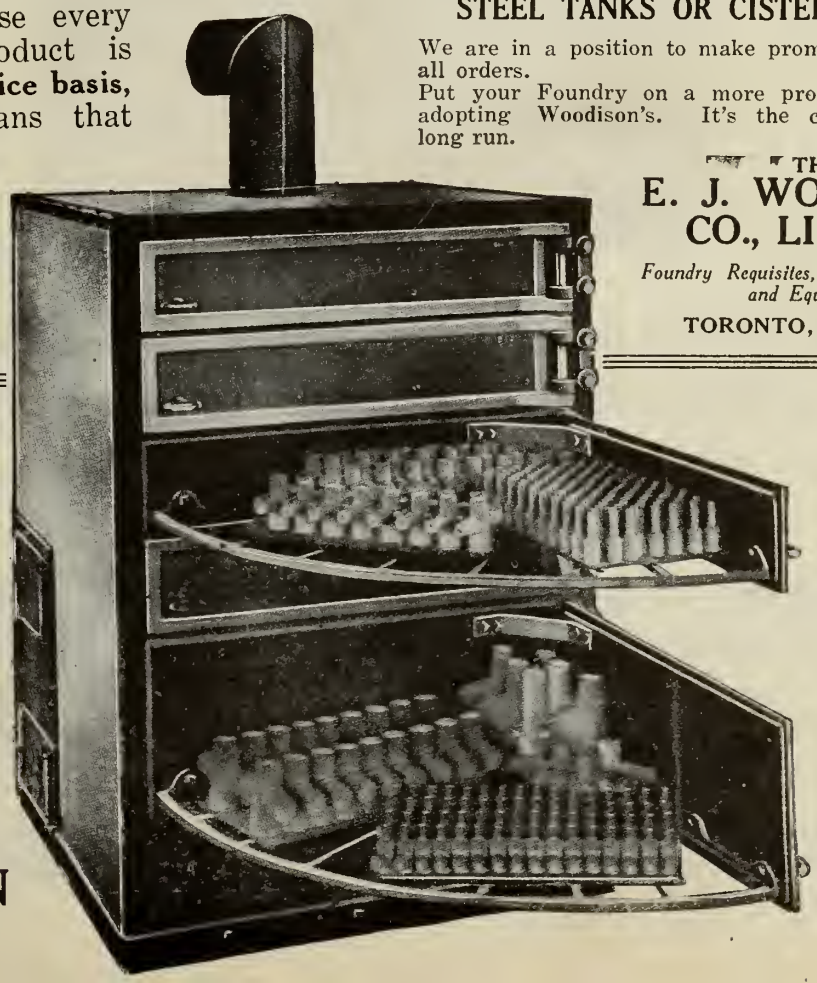
Foundry Requisites, Firebrick, Fireclay and Equipment.
TORONTO, ONTARIO

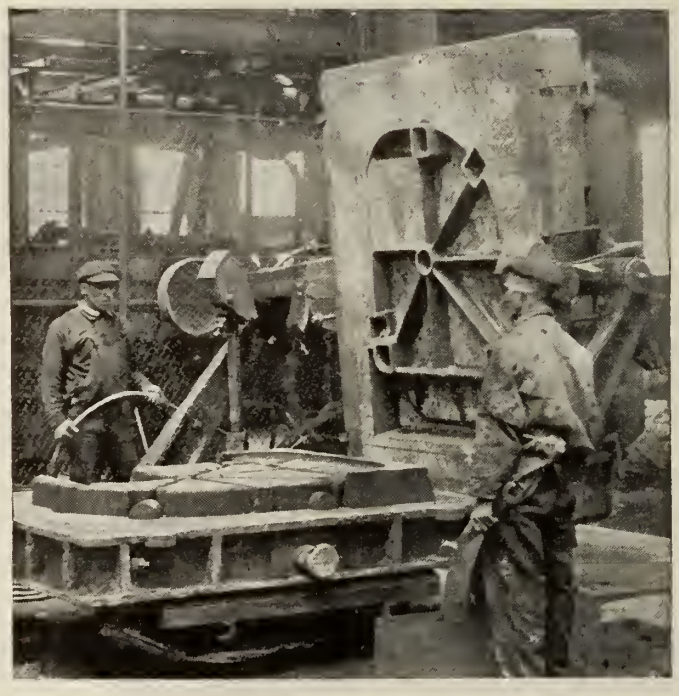


STANDARD CORE OVEN

You can save time and fuel by using this small core oven for small work. Consider the waste in fuel when you heat a large oven for small jobs. The Standard Core Oven is heated by gas, coal or coke. When the doors are open as in illustration, the baffle plate at the back closes, thus reducing heat loss to a minimum.

If It's a Herman, It's Worth Using It Made Its Way by the Way It's Made

Our plant is equipped and the design of our Jarr Independent Rollover and Pattern Drawing Machines is such to take care of your work of a medium or larger nature.



We will be thankful if you will send us your enquiry and let our Service Department advise with you on your molding machine requirements for such work.

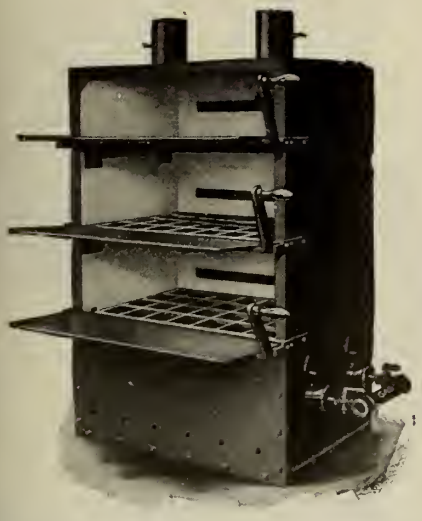
Herman Pneumatic Machine Company

GENERAL OFFICES: Union Bank Building, PITTSBURGH, PA.

MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U.S.A.

Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London S,W., Eng.

MONARCH
MELTING FURNACES

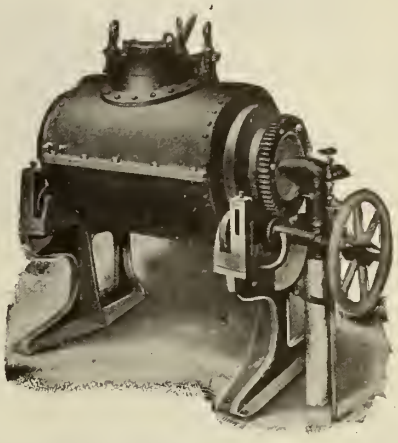


Monarch "ARUNDEL" Drop Front Core Oven—Any Fuel.

Will Increase Your Foundry Output

Twice as Many Melts!
Half as Much Fuel!

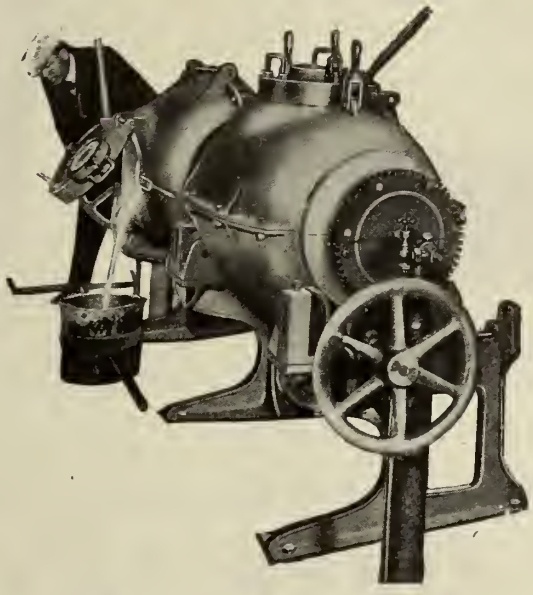
Monarch Melting Furnaces mean economy in its strictest sense, for without additional fuel they will melt two or three times as much metal as other furnaces.



Monarch Rockwell Single Chamber Furnace—"Simplex"

Special attention is drawn to Monarch Double Chamber Furnaces. They burn oil or gas, require less space, less fuel, less attention, and do twice the work in half the time. They utilize all the heat from the one and only burner. While melting in one chamber, the exhaust heat (something that other furnaces waste) is used to bring the metal in the other chamber to the melting point if desired.

The Monarch Double Chamber Furnace is 50 per cent. more economical than any other furnaces. Write us for proof and we will tell you more about it.



Monarch Double Chamber Melting Furnace.

Monarch Single Chamber "Simplex" Furnaces are built on the same lines as the double chamber furnace but without its continuous heating capacity. Best fuel economizer of its kind, oil or gas fuel.

Monarch "Arundel" Drop Front Core Ovens are hand made of sheet, and are heavily lined with sheet asbestos. Made in any size up to 8 ft. square.

Every minute you delay in finding out about Monarchs means an hour loss in manufacturing profit. Our catalogue describes fully each of our several types of furnaces. Write at once.

The Monarch Engineering & Mfg. Co.

1207 American Bldg., Md., U.S.A. **Shops at Curtis Bay, Md.**

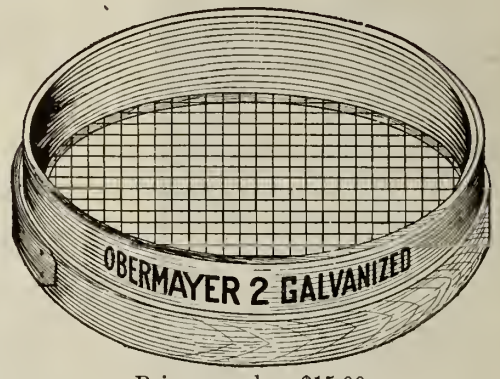
ESSO
TRADE MARK REGISTERED

Obermayer Makes the Best Foundry Supplies

Foundrymen tell us they last longer

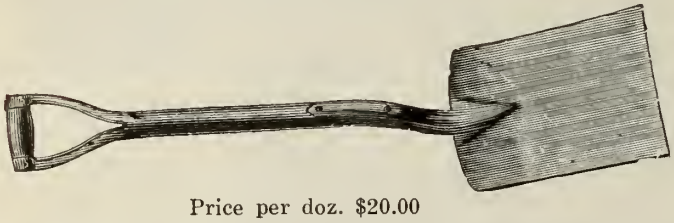
Price per doz. $36.00

Obermayer "Blue Buck" Bellows have a galvanized nozzle dipped in enamel to prevent rust. The leather won't crack or rot if it becomes wet.



Price per doz. $15.00

Obermayer Extra Heavy Foundry Riddles are made of elm rims, strong and smoothed to remove splinters. The wire cloth is heavy and galvanized after weaving.



Price per doz. $20.00

Obermayer Molders' Shovels are liked because they make the molders' work easier. The shank is bent just right.

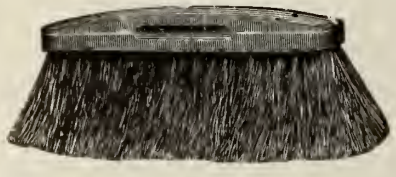


Fig. 3—Molders' Soft or Dusting Brush. Mixed Gray and Brown Horse Hair, brass wire drawn. 4 x 18 Rows. Ends 5 Rows. Extends 2¾″ out of block, which is 2-piece, size 2¼ x 9¾ x 1⅜″ nailed.

Price per Doz., $8.00

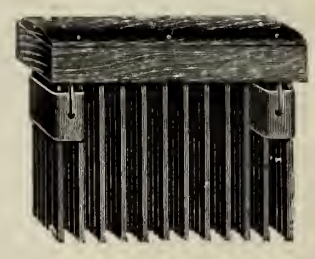


Fig. 29—Four-inch, 5 x 12 Row Bridled Casting Brush. Flat steel wires arranged in 12 rows. 10 wires to each hole, extending 4″ out of one-piece solid block. Ends of brush protected by steel bridles, the effectiveness of which need not be mentioned.

Price per Doz., $6.50

You will find that it is cheapest to buy the best.

THE S. OBERMAYER CO.

ESTABLISHED 1874

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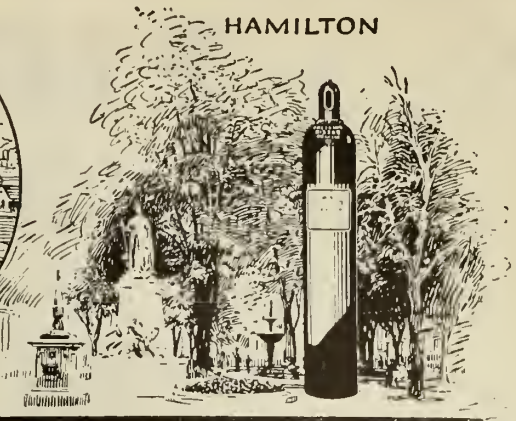

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IN accordance with its published program of expansion, the Dominion Oxygen Company, Limited, announces the opening of still another Distributting Station at Welland.

This new link in the Dominion Oxygen Service chain, together with similar stations at Montreal, Hamilton, Windsor and Toronto, make it possible to supply highly pure oxygen in any desired quantity to any point.

Every order for Dominion Oxygen is filled on the day it is received, thus insuring to Canadian oxygen users a never-failing and prompt supply in high capacity cylinders built for economical and safe handling.

By maintaining the high standard of purity of its product and by developing still further the efficiency of its distributing organization, the Dominion Oxygen Company, Limited, will strive to continue to merit the generous patronage accorded it by Canadian oxygen users.

DOMINION OXYGEN COMPANY, LIMITED

Hillcrest Park, Toronto

Hamilton Montreal, Welland, Windsor

D-16

PIG IRON

(ALL GRADES)

FERRO MANGANESE—FERRO SILICON

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A. C. LESLIE & CO., Limited, MONTREAL

CANADIAN HART WHEELS

CUT FASTER LAST LONGER

Than any other wheels on the market

Our New Modern Plant.

EMERY WHEELS A SPECIALTY
WE SOLICIT EXPORT TRADE

Tell us the service you want performed and we will supply you with an abrasive wheel that will save you time, money and worry.

Send for one of our catalogues and tell us your troubles. We do the rest.

CANADIAN HART PRODUCTS, Limited

Successors to

Canadian Hart Wheels, Limited

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ELECTRIC STEEL FURNACES
100 lbs. to 15 tons Capacity

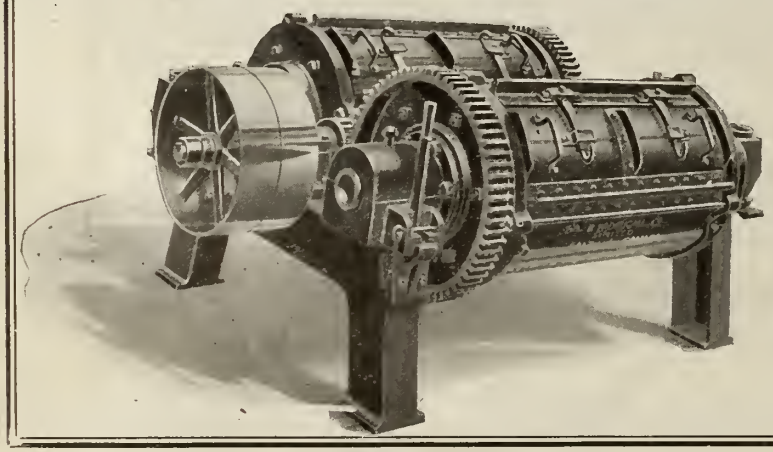
GRAY IRON CASTINGS
Electric Furnaces for making Gray Iron

ELECTRIC BRASS FURNACES
Made in standard sizes of ⅛, ¼, ½ and 1 ton capacity.

Electric Furnace Accessories of All Kinds

In order to meet and overcome strong competition you should reduce your production costs as well as metal losses. This can unquestionably be done by operating an electric furnace. Let us convince you that this is true.

The Volta Manufacturing Company, Ltd.
WELLAND, ONT.



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Constructed in the same efficient manner as all other McDougall products.

Each Mill may be run separately, which proves a decided advantage when filling or emptying.

Properly protected Ring Oiling Bearing.

Guaranteed for Long, Continuous, Satisfactory Service.

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GALT, ONTARIO

SCARFE'S No. 7
CORE OIL

SCARFE & COMPANY, LIMITED

Makers of Industrial Varnishes and Paints

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MOLDING SANDS

for

Steel, Malleable, Brass, Aluminum and Light Grey Iron Castings

Manufactured by Venango Sand Co., Franklin, Pa., are not equalled by any other sands on earth—we guarantee this. We also give service.

VENANGO SAND CO.
FRANKLIN, PA.

HAUCK
Compressed Air Type
BURNER
One Man Type

This burner burns the cheapest grade of crude, fuel, kerosene oil or distillate, with compressed air at any pressure varying from 20 to 100 pounds.

Built for Every-Day Hard Service
These Burners are Practically Indestructible

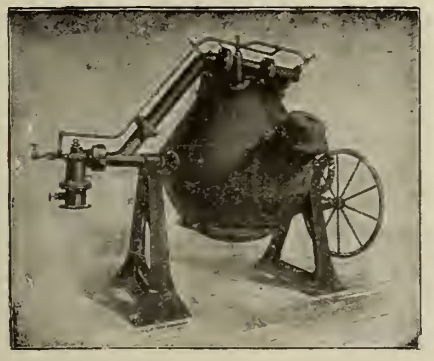
Hauck Burners perfectly atomize the oil, developing full heating value of fuel utilized, without loss of heat by radiation through lengthy or double nozzle construction. They are recognized for their reliability.

This burner is very light in weight, yet very strongly built and easy to handle which make it the most popular burner among users. Flame is steady and easily regulated to any size. The tank is equipped with seamless steel bottom, lapped, interlocked and brazed, tinned inside and out, equipped with handle so that it can be easily picked up by one man. Five gallon capacity.

The valves are made of the best composition. Pressure gauge registers 150 pounds. Equipped with 12 feet high pressure air hose, 12 feet interwoven and oil-resisting hose, each length with brass union connections. The burner is the latest improved type, made of steel, joints welded or brazed, equipped with oil needle valve, strainer and air regulating valve.

This burner is specially recommended in the foundry for drying moulds, drying and patching cores, skin drying, brazing, preheating before welding, etc.

THE CANADIAN HAUCK BURNER CO.
LIMITED
Head Office and Works: PORT HOPE, ONTARIO



The Hawley-Schwartz Furnace
The Only Perfect Melter
All metal from 50 lbs. to 10,000 lbs.
Is Absolutely Uniform

Write for catalog and complete information.

The Hawley Down Draft Furnace Co.
Easton, Penn., U.S.A.

The Cost Reducing "Riddle"

THE COMBS GYRATORY FOUNDRY RIDDLE is the only really portable riddle made. It weighs about ninety pounds and a man can carry it wherever needed. Just suspend it from any convenient support, screw the attachment plug into any lamp socket and it is ready for work. THE TIME OF EMPLOYEES IS THE MOST COSTLY THING ENTERING INTO THE COST OF CASTINGS. Every time you pay off your help a large percentage of the payroll is spent for screening sand. This machine will save a large sum out of your payroll and thus PAY FOR ITSELF in a short time. It will sift sand faster than one man can shovel into it, and screen more sand than ten laborers using hand riddles.

Type "V"

This machine MIXES as well as sifts, thus saving one turning of the sand. Evenly mixed and tempered sand reduces the time of making the mould, and insures a better mould, with fewer patches after drawing the pattern.

There are no legs to get in the way of the shovel and a wheelbarrow can be run under it. When placed between two moulding machines this Riddle will supply each with plenty of sand.

This Riddle has a true gyratory motion, giving double the capacity of any reciprocating machine of the same size. The sieve is 20 inches diameter and is held in place by an improved clamping device, thus enabling the operator to remove the sieve, dump, and replace in less time than it takes to tell about it. The motor is one-sixth horsepower, making the cost of electric current negligible.

This Riddle is now made in Toronto under Canadian patents and can be purchased with Canadian funds, thus eliminating any loss for "exchange."

For price and full information, address

GREAT WESTERN MANUFACTURING CO.

LEAVENWORTH, KANSAS, U. S. A.

SIMPSON

INTENSIVE FOUNDRY MIXER

"Product of a Practical Foundryman"

Better Castings Assured—

Let a Simpson Intensive Foundry Mixer do your sand mixing. You'll get better castings as a result. The Simpson is of proven economy and efficiency for every kind of sand mixture, particularly core sand and facing sand.

Simpson Intensive Foundry Mixers

Save **Labor, Binder** and **New Sand.** They operate with minimum power and maintenance cost and enormously increase the elasticity and toughness of the sand. It is almost incredible how soon a Simpson will pay for itself. Used and endorsed by the largest foundries in Canada and the United States.

Economical and Efficient for all kinds of sand mixtures in foundries producing steel, grey iron, malleable, brass and aluminum castings

The Six Points of Perfection

1. Correct size and speed of mullers.
2. Effective arrangement of plows.
3. Automatic discharge.
4. Large capacity per area of floor space occupied.
5. Minimum power and maintenance cost.
6. Considerably less new sand and binder required.

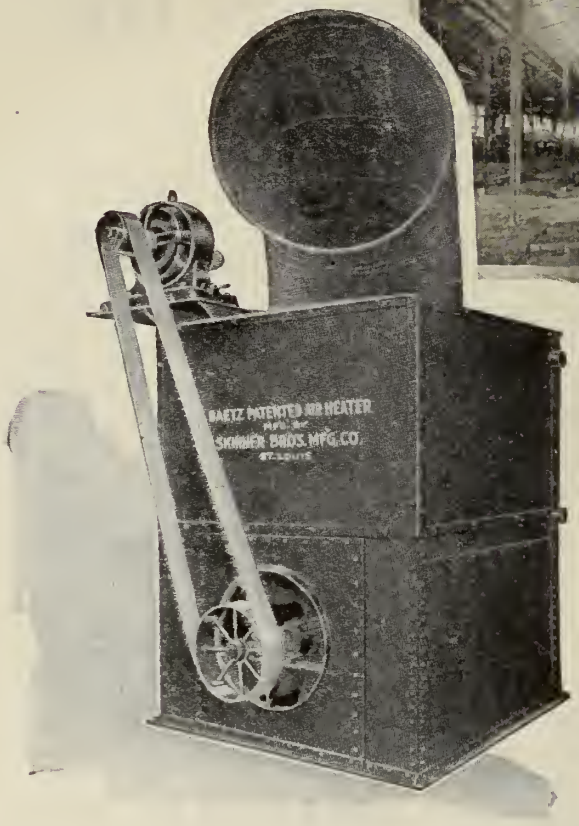
Send for Pamphlet No. 50 and list of Users

NATIONAL ENGINEERING CO.

Machinery Hall Bldg., 549 W. Washington St.

CHICAGO, ILLINOIS.

Showing installation of Skinner Bros. (Baetz Patent) Heaters in foundry of Best Foundry Co., Bedford, Ohio. Note extensive area served.



Heat Your Plant the Logical Way

Install the Skinner Bros. (Baetz Patent) Heating System and every corner of your foundry will be kept at the same uniform, comfortable temperature, regardless of weather conditions. This is the logical method of heating—sand never freezes, floor dust is not disturbed and your foundry is quickly heated after monitor windows are closed after pouring.

The Skinner Bros. (Baetz Patent) Heater applies only natural laws and is simple and positive in action. Requires no pipes or ducts, is portable, needs no special foundation, and installation cost is 15 to 50% lower than any other type. Operating cost is equally low.

The principle of operation which makes this heating system so thoroughly effective is outlined at the left.

Performance guaranteed—if a Skinner Heater should ever fail, it would become immediately returnable to the factory and every cent of your money refunded.

Mechanical Details

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a powerful fan-wheel. Coils are heated by exhaust or live steam. Cold air is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, is diffused through outlet hoods to every part of the open area. No pipes or ducts used. The fan is operated by any power available.

Direct-Fired Type

Where steam is not available, we supply our direct-fired type DF, which burns coal, coke or wood. Built on the same scientific principle as type SC. The fan is operated by any power available.

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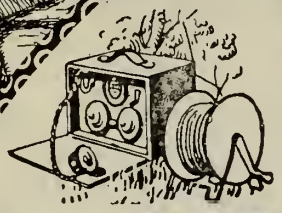

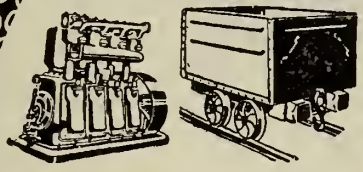

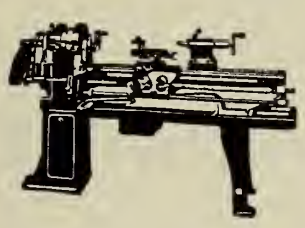

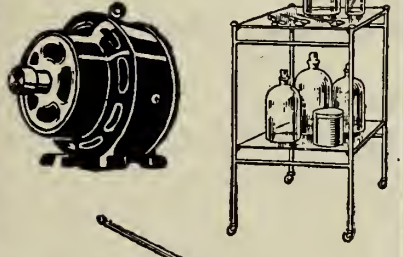

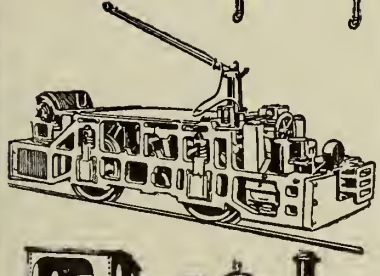

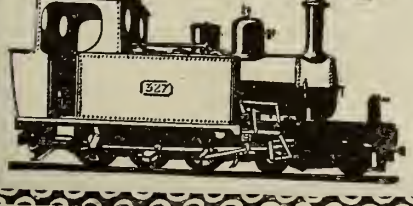

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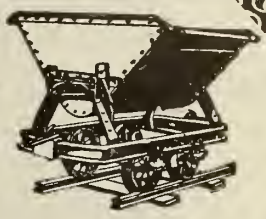

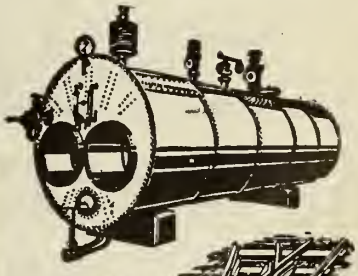

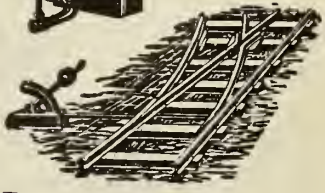

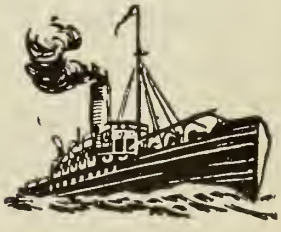

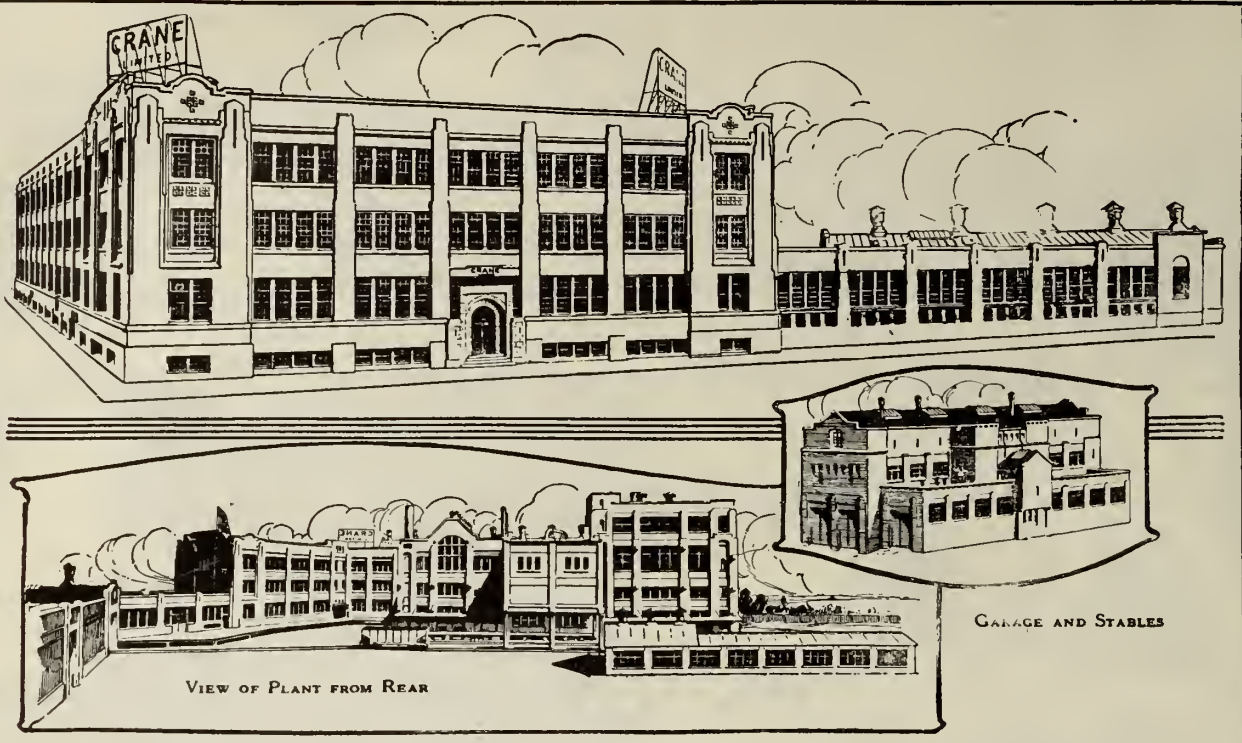

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His work, as compared with his predecessors, was considered nothing short of marvelous, and in a short while Mr. Henry Peot, the foundry foreman, enrolled—Several months later a class was formed, and in addition to working through our regular course, the members meet every Thursday evening for discussions.

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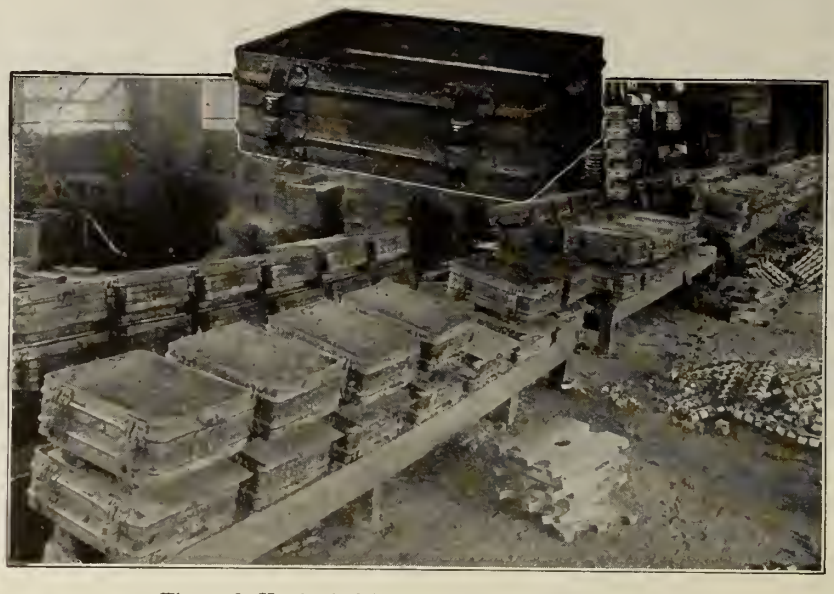

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Service Record

Years of service—4 years. Nature of casting — Bushings. How used—Hand Squeezer Machine. Size of Flask—12½" x 18" x 3" Cope x 3" Drag. Weight of Flask—33 lbs. Flasks of this size in use 591. Total Sterling Flasks in use 847.

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The above general view shows a floor of fly wheels in the foundry of The Hamilton Foundry & Machine Co., Hamilton, Ohio. Two types of Osborn Moulding Machines make this production of intricate work possible.

The insert at the left shows these machines at work. An Osborn No. 402 Direct Draw Roll-Over Jolt Machine makes the drags and a No. 449 Stripping Plate Jolt Machine makes the cheeks.

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Also ask for your copy of the 1920 Condensed Catalog.

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No. 403W	40″ x 52″	
No. 404	52″ x 54″	
No. 405	60″ x 64″	
No. 406	60″ x 78″	

Osborn Jolt Stripping Machines

Made Regularly in the Following Sizes:

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No. 405LS	29″ x 60″	
No. 406S	42″ x 75″	
No. 448	18″ x 18″	
No. 449	21″ x 22″	
No. 449L	29″ x 29″	
No. 450	19″ x 36″	
No. 450W	26″ x 36″	
No. 450M	26″ x 42″	
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CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Members of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

Electricity—Its Varied Uses in the Foundry

Showing the Theory of Melting by Electricity, Explaining the Dynamo and Motor, Also General Review of the Electric Current From Its Discovery

By F. H. BELL

IN OUR discourse on cranes we referred to electricity as one of the forces used in operating the modern crane. Like compressed air, referred to in our December issue, electricity finds many occupations in the foundry and a brief story of its history and some of its notable characteristics will, no doubt, be of interest before going into the uses to which it can be put in the foundry.

In ordinary language electricity may be said to be a powerful physical agent which makes its existence manifest by attractions and repulsions, by producing light and heat, commotions, chemical decompositions, and other phenomena.

History

About 600 B.C. Thal discovered that, when amber was rubbed with silk it became capable of attracting light bodies. The ancients seem to have known no more than this regarding electricity, nor for the first sixteen centuries of the Christian era was much addition made to this solitary known fact in electricity.

In A.D. 1600, Gilbert, who was surgeon to Queen Elizabeth and to James I, published a book, entitled "De Magnete," in which for the first time the word "electric" was used in connection with science. He died in 1603 but during the short time at his disposal he brought out a number of ideas for others to build upon. He regarded magnetism and electricity as two emanations of one fundamental force. He showed that not only amber, but sulphur, glass and various other substances are electrics. Otto Guericke, of Magdeburg, discovered that there was a repulsive as well as an attractive force in electricity, and about 1647 constructed the first electrical machine.

Newton, in 1675, observed signs of electrical excitement in a rubbed plate of glass. Hawkesbee, who wrote a book on science in 1709, also observed similar phenomena, and Dufay, in the "Memoirs of the French Academy," between 1733 and 1737, generalized so far as to lay down the principle that electric bodies attract all those which are not so, and repel them as soon as they have become electric by the vicinity or contact with glass.

Dufay also discovered that a body electrified by contact with a resinous substance repelled another electrified in a similar way and attracted one which had been electrified by contact with glass.

He thence concluded that the electricity derived from those two sources was of different kinds, and applied the names vitreous and resinous to them. Franklin attributed this difference to an excess or deficiency of the electric fluid, the former condition existing in electrified glass and the latter in resins.

Otto Guericke had discovered that his sulphur globe, when rubbed in a dark place, emitted faint flashes of light, and shortly afterwards it was noticed a similar phenomenon occurred at the surface of the mercury when the barometer was shaken; a fact which one of the celebrated mathematicians, Bemoulli, attempted to explain on the Cartesian system, but which was afterwards correctly attributed by Hawkesbee to electricity. Wall, in 1708, observed the sparks produced from amber, and Hawkesbee noticed the sparks and "snapping" under various modifications.

Dufay and the Abbé Nollet were the first to draw sparks from the human body, an experiment which attracted great attention and became a species of fashionable diversion at the time.

The discovery of the

SOME LEADING ARTICLES IN THIS ISSUE

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Leyden jar is attributed to Cunaeus of Leyden, in 1746, who, while handling a vessel containing water in communication with an electrical machine, was surprised at receiving a severe shock; a similar event had happened the year previous to Von Kleinst, a German prelate.

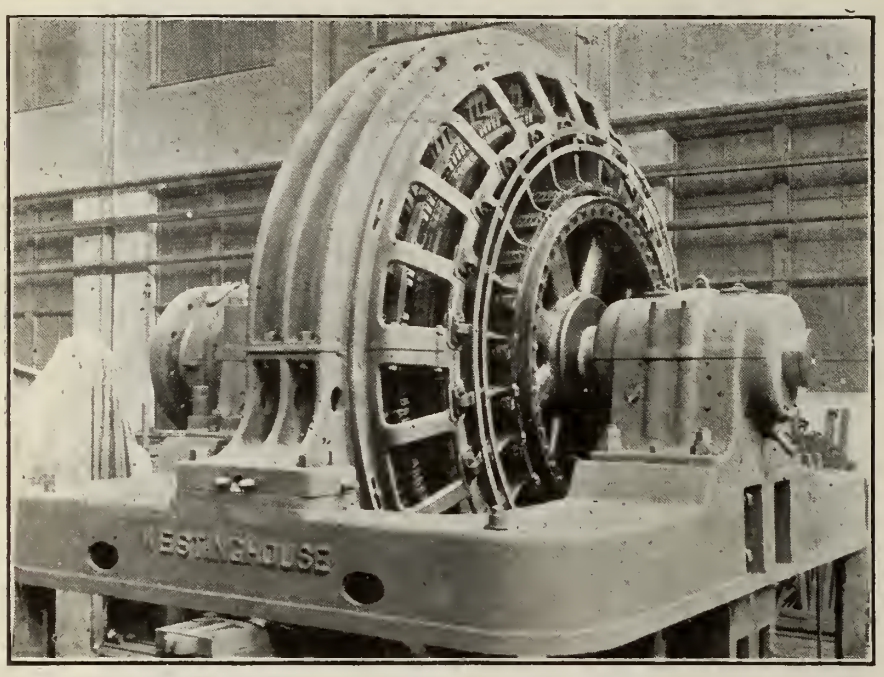


FIG. 1—A TYPICAL ELECTRIC GENERATOR.

Guericke was the great electrician of the seventeenth century; in the eighteenth century the names of the principal contributors to the advancement of electrical science were Newton, Hawkesbee, Dufay; Cunaeus of Leyden to whom we owe the Leyden jar, and Franklin, who, in 1747, pointed out the circumstances, on which the action of the Leyden jar depends. Monnier the younger discovered that the electricity which bodies can receive depends on their surface rather than their mass, and Franklin soon found that "the whole force of the bottle and the power of giving a shock is in the glass itself;" he further in 1750, suggested that electricity and lightning were identical in their nature, and in 1752 demonstrated this fact by means of his kite and key. About the same time D'Alibard and others in France erected a pointed rod forty feet high at Marli, for the purpose of verifying Franklin's theory, which was found to give sparks on the passage of a thunder cloud. Similar experiments were repeated throughout Europe, and in 1753 Richman was instantly killed at St. Petersburg by a discharge from a rod of this kind.

The more important discoveries since those days relate rather to electricity produced by voltaic or magnetic action.

Later History

In the later history of electricity no name is greater than that of Michael Faraday, who was born in London in 1794; was appointed by Sir Humphrey Davy to the position of assistant in the laboratory of the Royal Institution in March 1813, and who in 1831 commenced the publication of a series of splendid discoveries in electricity.

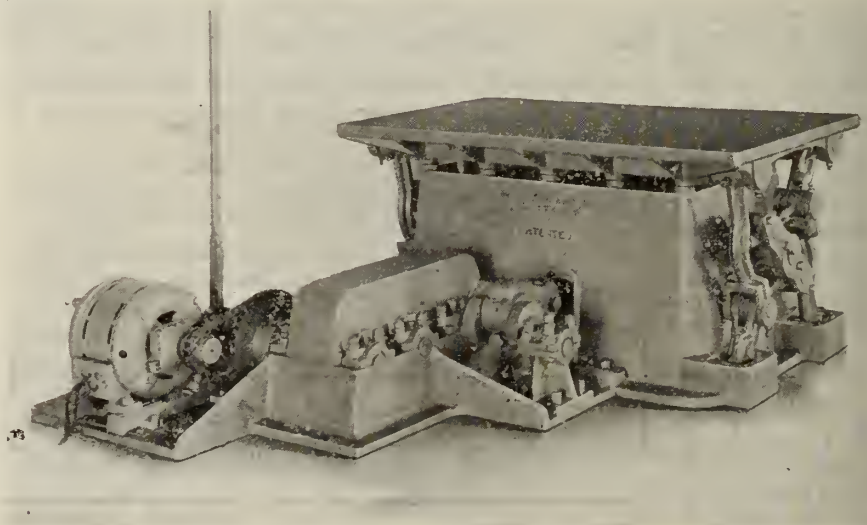
Present State of Knowledge

The past history of electricity centers round the frictional machine and the voltaic battery. The first-named is now only of experimental interest, and the second, if we except its use on signalling (telegraphy and telephony) has been practically supplanted by the more economical and vastly more powerful dynamo-machine. To this contrivance, in its various forms as designed by different makers, and in a less degree to the secondary battery electricians, have succeeded in the advancement of their science to its present state of usefulness.

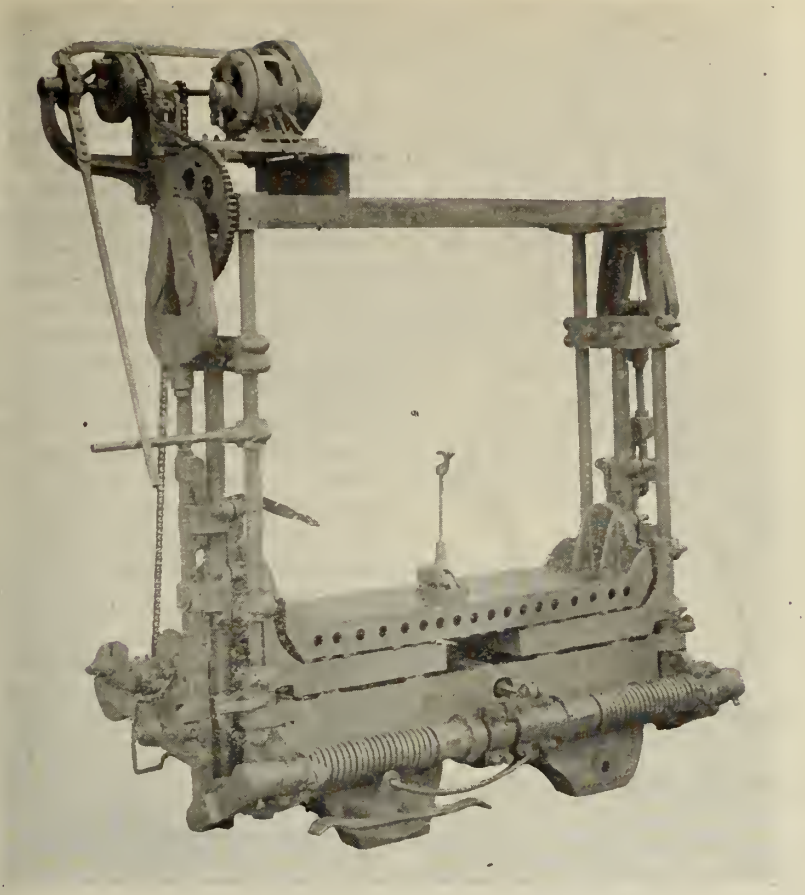
The fact that dynamos could be made reversible is considered to be one of the most important discoveries of the last century. By reversible is meant its power to act as a motor when coupled up with a distant machine, under which circumstances its armature revolves in the reverse direction to what it would do if used directly—as in the production of the electric light. By such means the electrical transmission of power from place to place has become possible.

The advantages of electric power, or more properly speaking, electric transmission of power are many. A power plant is located at a convenient place and wires are run in all directions to carry the power to the motors, wherever they may be located. By this means it is possible to place a water wheel wherever there happens to be a waterfall, no matter where the location may be and by simply running the transmission line to the desired location the power is brought to the plant instead of locating the plant to suit the power. That Canada possesses one of the greatest systems of waterpower in the world is an undoubted fact and one which makes doubly sure the success of electrically operated industries in this country. Niagara Falls alone has available electrical power of 10,700,000 horse-power. It is estimated that 280,000 cubic feet of water goes over the falls every second and 90 per cent. of this is on the Canadian side. This power is developed to a considerable extent at present and enormous additional development is under way and will be in readiness in the near future. Other water power of lesser magnitude is available in every part of Canada. This being the case a brief review of the electrically driven equipment of the foundry will be of interest, but before proceeding with the subject I will refer once more to the Niagara river and the Chippawa Canal project where the 61,000 horse-power water wheels and the 45,000 kilo-volt-ampere dynamos are to be installed.

In the February issue of Canadian Foundryman I endeavored to show the readers how a large dynamo base was made in a Toronto foundry and in order to convince them that it was genuine I gave a little review of the work being done along the Niagara River. In my story I gave a few figures to show that the possibilities in connection with this Niagara power scheme were such as to warrant the installation of electric generators of greater capacity than anything heretofore constructed in any country. I knew I was straying away from the subject of making big castings and in fact away from the field of a foundry paper when I began to dilate on the wonders of the mighty Niagara. But I also knew that to pretend that Canada was becoming a leader in turning out big work it would be necessary to bring out some very forcible arguments in connection with how we came to get the job before I undertook to explain how we did the work.



TOGGLE DRIVEN JOLTER DRIVEN BY ELECTRIC MOTOR.



RUNNING MOLDING MACHINE BY ELECTRIC MOTOR.

Was Acceptable to Readers

However I received some very flattering comments on it from readers who confessed that they never knew before what the Chippawa Canal was to be for, and some went so far as to suggest that I follow up that line of material and not bother with foundry work. This, I do not intend to do, but in order to back up what I have already stated I will go a little further into the geography of the lakes and rivers with which we have been favored by Nature.

If we look into the common school geography or in any encyclopedia we will see that Lake Ontario is 246 feet above the level of the ocean and that Lake Erie is 572 feet above the ocean. If we subtract one from the other we will find that Lake Erie is 326 feet above Lake Ontario. The other lakes forming the chain which all told contain more than half of the fresh water of the globe are still higher and all empty into Lake Erie which in turn is connected to Lake Ontario by the Niagara River. From this it will be seen that half the freshwater of the globe is connected with the Atlantic ocean by means ofthe Niagara river.

The Niagara River is 33 miles long and the Falls are about 20 miles or a little less from Lake Erie. Now when we consider that we have hundreds of rivers and creeks draining a large portion of the North American continent and connecting up with the Great Lakes, and practically all of this water finding its way through this river we must conclude that an enormous amount of water is passing.

If the reader wishes to see the Niagara with all its majesty he should take the American side of the river and then look towards Canada.

Starting at Lake Erie and following the shore he will notice a pretty stiff current but not sufficient to show any great incline until he comes to Port Day at the head of the upper rapids which are about a mile above the Falls. In this distance the falls amounts to about 10 feet. After this it begins to assume a much different appearance. The speed increases, and in spite of the depth the water turns white with foam. and in the remaining mile it falls another 58 feet.

At the Falls the river is divided by an island called Goat Island, but in consequence of a bend in the channel, by far the largest portion of the water is sent down by the Canadian side. On this side, therefore, is the grander cataract, which is commonly known as the Horseshoe Fall on account of its shape. Here it falls 158 feet and has a width of approximately two thousand feet. Needless to say its white color has disappeared by this time. The water is so deep that it retains its green color for some distance below the brow of the precipice; and it rushes over with such force that it is thrown about fifty feet beyond the cliff.

The separation caused by Goat Island leaves a wall of rock between the Canadian and American Falls. The latter falls is about 8 feet higher than the former on account of the water in passing on that side of the island not having the deep channel and consequently not having the pitch before it gets to the brink where it falls over.

If the reader has been watching he will see that from Lake Erie to Port Day the river fell 10 feet. From Port Day to the Falls it falls 58 feet, and in going over the Falls it drops 158 feet. If he follows it for another four miles he will see that it falls another 55 feet, after which it falls about 5 feet in the next two miles and then continues on its journey in practically a level course. Another thing he will observe is that while the water keeps lowering, the banks seem to remain at their full height, and at Queenston Heights, where the big monument stands in memory of General Brock, the bank is over three hundred feet above the water, so that a canal cut into the rock on top of this bank will be practically level from Chippawa to Queenston, and at the Queenston end will have a head of three hundred feet. Here will be the 61,000 horse power water wheels and the 45,000 K.V.A. dynamos mentioned in the February issue of Canadian Foundryman.

From this it will be seen that Canada is favored with abundant water power and as this is only one of our many falls and not even our greatest it will be seen that electricity is to play a prominent part in Canada's development. While this is our greatest one at present developed the St. Lawrence is offering something which is said to be of far greater magnitude. The water after leaving the Niagara river has yet to fall 256 feet before getting to the Atlantic. This coupled with the water from the Ottawa and other rivers is said to be more powerful than the Niagara.

It must not be supposed that electricity depends on water power, as steam or gas is equally as efficient but where fuel is hard to get and water power is plenty the water is to be preferred. Whatever power is used the dynamo or generator as it is sometimes called generates the electricity.

In the illustration, Fig. 1, will be seen the fundamental principles of a generator.

The motor, as we have already seen, is similar to this but runs in the opposite direction when connected to the generator. The generator may be stationed in the engine room of the plant or it may be at Niagara Falls or anywhere else, and if we want to use the power to drive the foundry blower

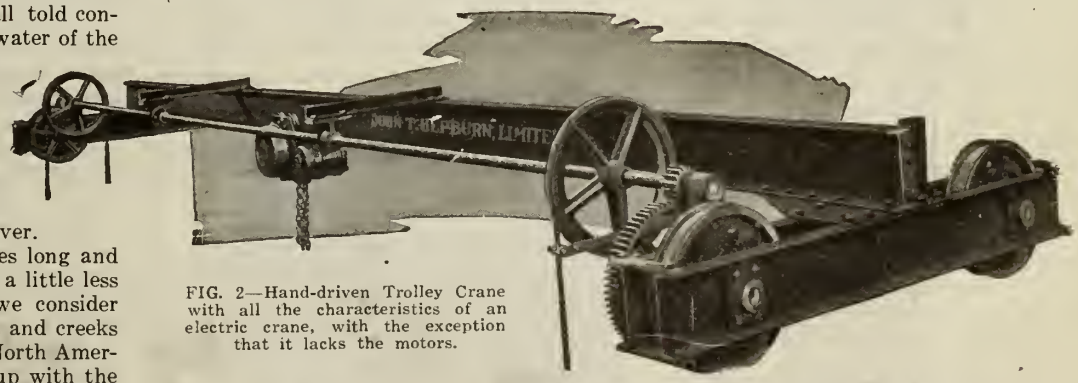


FIG. 2—Hand-driven Trolley Crane with all the characteristics of an electric crane, with the exception that it lacks the motors.

we place the motor wherever we wish to have the blower located, and connect it to the generator by means of wires. Two wires are always required, as electricity will only travel where there is a circuit. If the circuit is broken the electricity ceases to travel. It will be seen from this that one wire may remain connected and if we have a switch on the other we simply close the switch to start the motor, and open it to break the circuit and stop the motor. The motor may be connected to a shaft from which different machines may be driven, or individual motors may be direct connected to the different machines.

The Electric Crane

An electric crane, Fig. 2, is just the same as a hand power or any other type of crane but instead of being driven by hand these individual motors are placed where they will do the work. One moves the crane along the track and another on each hoisting drum does that work.

The Electric Arc

If in closing the switch it happens to be loose so that it does not quite close and the circuit is not complete, the current will jump over the gap if it is not too great, but in doing so it will cause a spark which will of course consume some of the electricity. This gap in the circuit is known as an arc and the light which is caused by the spark is an arc light. From this we learn one method of making electric light. But if we have a spark big enough to make light we must have something different from metallic fixtures in order to prevent them from melting. For this purpose any material which will stand the heat and at the same time carry the current will suffice. There is no material which will do this without being consumed in time, but different carbon or graphite electrodes are in use which will stand for a long while. In the illustration, Fig. 3, will be seen the type of electric lamp which was for many years a common sight on our streets. The current enters by one wire and after passing through the carbon electrodes passes out by the other wire. As these carbons burn away they automatically come together close enough to form the arc and keep the electricity burning.

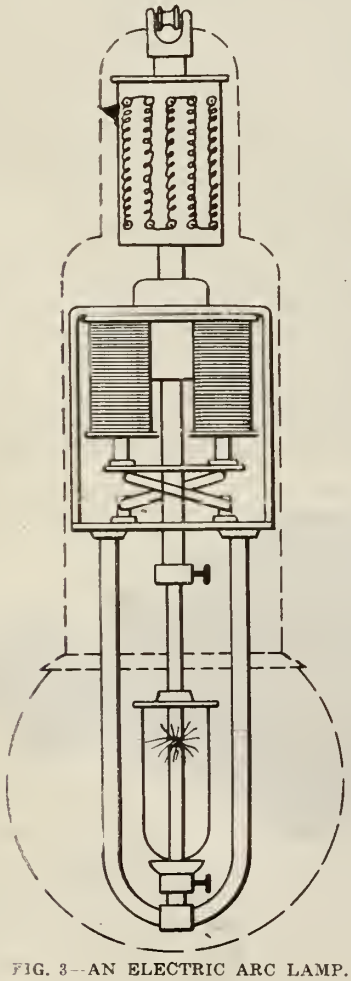


FIG. 3—AN ELECTRIC ARC LAMP.

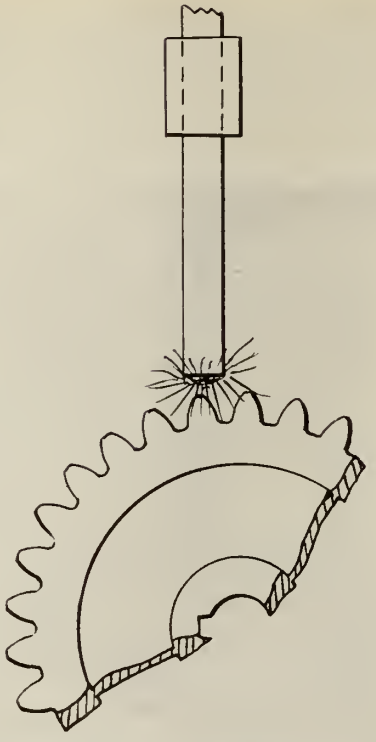


FIG. 4—BOTTOM CARBON REMOVED AND PIECE OF SCRAP PUT IN ITS PLACE.

Now supposing we remove the bottom carbon and replace it with a piece of scrap iron as shown in Fig. 4, the arc would still be formed and light and heat would still be produced, but the scrap iron would not long survive the heat but would melt and run away. As this proceeded the upper carbon would follow it, keeping the arc burning until all the iron was melted. This is the principle on which the electric melting furnace works. The metal is put into the crucible of the furnace and the current passes through it as well as through the electrode and the arc is formed between them. As the metal melts and settles down, the electrode follows and keeps up the heat until all the metal is melted.

Various types of electric furnace are on the market, each having its peculiar features but all depending on the same fundamental principle that an arc must be formed with the metal which is to be melted forming one of the poles or electrodes.

Since Canada is leading the world in developing electric energy, electrically driven equipment will undoubtedly play a prominent part in the industrial activities of the country in the immediate future.

THE MOST EFFICIENT DESIGN OF ELECTRIC STEEL FURNACE

Mr. Young, of the Volta Manufacturing Company, Welland, Ont., in replying to an article in an American publication, writes as follows:

In an article appearing in your issue of January 15th, written by Messrs. James W. Galvin and Chas. N. Ring, certain assertions are made relative to the lining of electric steel furnaces, the slope of the hearth and the heating effect of the current.

Considering, first, the heating effect of the current, the heat generated in an electric furnace can be put down to two main causes —first the heat from the arc itself. This is radiated to the surface of the metal and thence through the entire mass by conduction to the other electrode. There are no convection heat currents, as the heat is applied from above. In other words, the furnace could be made so deep that only the upper part would be melted and the lower part would remain cold. Secondly—that heat which arises through the current passing through the metal. This could be expressed as 1^2 R. losses. The electric resistancy of the charge varies, being higher at the commencement of the heat and gradually dying down as the charge becomes fluid. At no time, however, is this resistance very great, as the metallic path afforded the current is of a very large area, so that the 1^2 R losses are very small and any heating effect which could be derived in that matter is almost negligible. Increasing the depth of the bath would increase the metallic area for the current to pass through and so decrease the resistance and heating effect of the current due to the 1^2 R. losses.

The heat generated in the arc is far greater than that generated by the current in the charge. This can easily be seen if one considers the power consumed in the two parts of the circuit. The voltage drop across the arc is a large proportion of the total voltage for, if the electrode is allowed to touch the metal, a short circuit results. Therefore practically all the power is consumed in the arc.

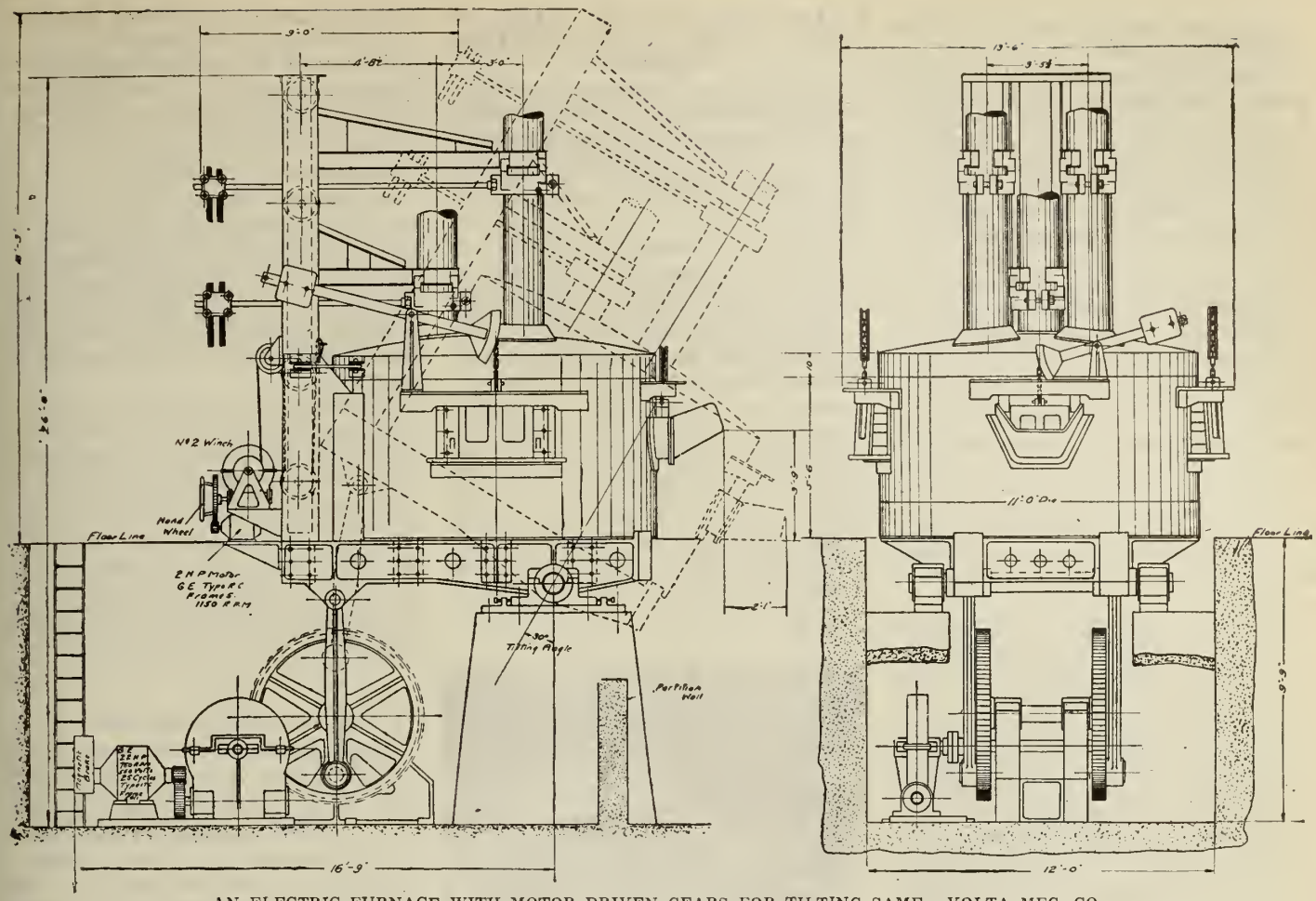
From the above it is obvious that for quick melting and high efficiency the following would be ideal conditions for an electric steel furnace.:

1. A shallow bath, of sufficient area, which would allow the radiated heat from the arc to be quickly conducted through the entire charge.

2. Electrodes of large diameter, which would spread the arc over a large area and protect the roof from the direct radiation of the arc.

3. High voltage, which would produce a long arc and so tend to spread it over a larger surface of the charge.

Leaving a certain amount of molten metal in the furnace would tend towards a more constant resistance of the charge at the beginning of the melt, and therefore reduce fluctuations in load, but it would also tend towards a lower efficiency as the heat lost by it during the charging periods, through radiation, would have to be added to bring it back to pouring temperature.



AN ELECTRIC FURNACE WITH MOTOR DRIVEN GEARS FOR TILTING SAME. VOLTA MFG. CO.

HEAT LOSSES IN ELECTRIC STEEL FURNACES

By Frank Hodson, President Electric Furnace Construction Company

An excellent paper was recently presented before the American Electro - Chemical Society, Cleveland meeting by Mr. M. R. Wolfe and V. de Wysocki on the heat losses through electrodes on a 3 electrode 6-ton furnace.

The figures given in this paper will, no doubt, surprise many electric furnace users as to the amount and cost of power they are losing through the furnace roof. After a close study of this particular problem for the last four years, the writer is only surprised that the losses recorded were not larger. If the amount of heat in the shape of flame that escapes from most furnace roofs were taken fully into account, the loss would be found to be nearer 30 than 18.7 per cent. The method employed by the authors of the paper, whilst giving actual heat losses from the electrodes, only gives heat absorbed by the water cooler—a great deal more than this is usually lost.

In considering these heat losses, which perhaps would be better described as through the furnace roof rather than through the electrodes, it might be interesting to consider how the conditions governing the loss of heat and power can be improved.

Broadly speaking, the causes are:

(1) Heating up of electrode, due to faulty electrode joint or defective electrode.

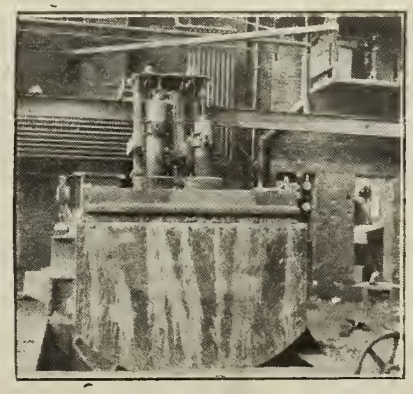
(2) Heating up of electrode, due to imperfect contact or badly designed electrode holders.

(3) Heating up of electrode, due to electrode pencilling off at point of arc.

(4) Heating up of electrode, due to oxygen from the air combining with the carbon of electrode and burning off.

Item 1.—Special care should always be taken in jointing up electrodes—troubles due to this become increasingly worse as the melt proceeds. Good quality electrodes can now be purchased and it pays to pay even a little higher price for proved electrodes.

Item 2.—Design of electrode holder should be carefully considered and changed if undue losses occur. With proper contact, little or no heating should occur here—on our own furnaces we have not found it necessary to install water cooled holders, looking upon these as an admission of failure to get proper electrical contact.



A "ONE-TON" GREAVES-ETCHELLS FURNACE.

Items 3 and 4.—**Pencilling of Electrodes.** This is probably the indirect cause of more heat losses than any other feature. It is accentuated in cases where too large a space is left between the electrodes and the cooling ring, or where the furnace doors are not kept properly closed at the bottom or where, as in some cases, the melter has to unduly open his doors to inspect or rabble his molten charge. The air strikes the white hot electrode and burns away carbon, the hold in the roof acts as a flue draft, and the electrode pencils off, so that the area at the bottom, where the arc is, is often only one-fifth of what the furnace builders have designed to carry the power behind the furnace. The current continues to flow through this restricted area of electrode, and its resistance to the excessive current over the smaller area results in the whole electrode heating up, instead of going into the arc. This also causes trouble with the joints, with the holders and on all the outside electrical connections. Sometimes large pieces or flakes of electrodes break off, due to the increased resistance.

With the above facts in mind, our metallurgists have been working for the last five years to try and prevent this pencilling and heating up of electrodes. It was realized early in the investigation that if the flame could be prevented from blazing out at the top that one of the chief causes, viz., pencilling, would be largely overcome. Experiments have been made with over a dozen different types of water cooler, and also

attempts were made to insert an inert gas under the furnace roof.

As a result of these experiments, Mr. F. W. Brooke, vice-president of the Electric Furnace Construction Co., has developed a type of electrode cooling ring or "Electrode Economizer," now fitted as standard on all Greaves-Etchells Furnaces, that really does prevent this flame and consequent pencilling of electrodes and other troubles caused thereby.

These Economizers have been fitted to a number of furnaces and have stood up remarkably well. Some have been in constant operation for six months, and are as good now as the day installed. The invention is covered by patents, but the company can supply these for all types of furnace. A full description of this device was presented at the recent meeting of the Association of Iron and Steel Electrical Engineers, by Mr. E. T. Moore, chairman of the Electric Furnace Committee, pages 92 to 95, September 1920 report, but a brief description will probably interest A.E.S. members.

The Brooke "Economizer" depends for its action on the well known scientific fact that hot gases under pressure, if suddenly allowed to expand, quickly lose their high temperature. The gases generated in an electric furnace are only combustible at high temperature and in the presence of oxygen. All other cooling rings simply content themselves with cooling these burning gases. In the Brooke economizer the gases never do ignite, the roof ports and the electrode are kept reasonably cool and the gases leaving the furnace are at too low a temperature to ignite.

The gases pass first of all in between the electrode and the port hole roof, and then through the small clearance marked A, Fig. 10, into the cooling ring and into a relatively larger chamber B, which causes the expansion of the gases thereby giving up a large amount of sensible heat in the gases. This heat is absorbed by the water in the cooling ring. From chamber B they are once more contracted through the small clearance C and then passed to a very large Chamber D for a second and chief expansion.

The design differs slightly with amorphous or graphite carbon electrodes, but the effect is that no flame is seen from the top of the furnace and the electrodes do not pencil off.

The attached photograph of a one ton "Greaves-Etchells" furnace at the Sullivan Machinery Co., Claremont, shows the actual size of the cooling ring, and it will be noticed that they occupy no more space than ordinary cooling rings.

On a recently installed four electrode furnace, the monthly figures were 12½ lbs. of graphite electrodes per ton. The average over six months was 13 lbs.

No flame comes out of furnace roof even when carbon is thrown on the slag and it can be seen with the naked eye that the temperature of electrodes is far less and therefore considerable saving of heat and power does take place.

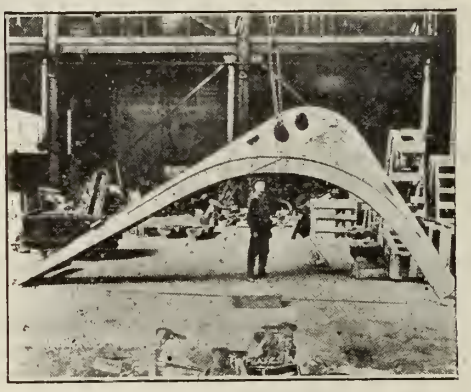
A FAIR SIZED CASTING MADE OF STEEL MELTED IN AN ELECTRIC FURNACE

The photograph illustrates a large steel casting made for the U.S.S. *Dobbin*, made in the Navy Foundry. The metal was melted in a 3-ton "GREAVES-ETCHELLS" Electric Furnace supplied by the Electric Furnace Construction Co., 908 Chestnut St. Philadelphia.

14,850 lbs. of material was charged into the three-ton furnace, and the power consumption for this exceptionally large heat was only 801 KWH per ton. The engineering officer reported that the casting was of very fine quality and showed the following chemical analysis:

Carbon	.38
Manganese	.89
Phosphorus	.008
Sulphur	.002
Silicon	.33
Nickel	.69

The full pattern was received from the pattern shop. The drag side of the mold was produced by what is known as "bedding in" in the foundry floor, the cope side of the casting being rammed up in a flask.



NOTE THE CASTING COMPARED IN SIZE TO THE MAN.

After the pattern was drawn from the mold, the cope and drag were dressed and the cope set upon iron blocks about eight (8) inches above the drag. The space between the iron blocks was filled with brick in order to retain the heat within the mold.

The drying of the mold was performed by using a low pressure oil burner located at one end of the mold, two (2) days were required for drying the mold.

Physical tests obtained from test specimens cast on this casting were:

	Yield Point Lbs.	Tensile Strength Lbs.	Elongation.
Specimen No. 1	58,000	89,500	25%
Specimen No. 2	55,250	89,000	25%

The electric furnace in the Philadelphia Navy Yard has been in operation for about a year, but it is believed that this charge constitutes a record for this class of casting and shows the great adaptability of the electric furnace when properly operated.

IMPORTANT NEW DEVELOPMENT IN ELECTRICALLY HEATED ANNEALING FURNACES

The Electric Furnace Construction Co., 908 Chestnut street, Philadelphia, announce they have secured an order from the Sociedad Espanola de Construccion Naval, Madrid, Spain, for a new design of electrically heated car type annealing furnace for heat treatment of large steel ingots and forgings.

The furnace will be the largest electric furnace in the world for this particular class of work, and the dimensions are 6,800 mm. long x 4,750 mm. wide x 4,140 mm. high, and will heat a charge of 60 tons of steel to 1,700 degrees Fah. every 24 hours.

The Electric Furnace Construction Co. has already supplied the same Company with an electrically heated furnace 36 ft. deep by 12 ft. outside diameter for heat treatment of gun and large forgings. The heat regulation on both furnaces is entirely automatic in regulation and a predetermined heat of within 5 degrees plus or minus can be secured.

Furnaces of this type offer a big field for the Power Supply Companies, as they have a unity power factor and usually are operated continuously. Under such conditions, it will pay power suppliers to give very special rates and the furnace user should also bear in mind that such electrical installations will bring up his power load factor and often insure a better rate for all his power. The Canadian interests of the supplying company in Canada are handled by the General Combustion Co. of Canada, Montreal.

THE MAGNETIC SEPARATOR

Among the many units of foundry equipment which are unique in filling positions which could not be filled by any other means there is none which can surpass the magnetic separator. This machine is well known to most foundrymen but it does not seem to be as well understood as it should be. In a brass works it is a well established custom to save all the turnings from the machines as this is valuable material, but it has one drawback. If the least speck of iron or steel gets mixed into it the speck will not mix with the melted brass, but will remain intact and in addition to this will gather a small amount of the brass to itself, making this bit of brass harder than the iron which caused it. This speck will be so hard that it will ruin any piece of machinery in which it lodges. To avoid this the magnetic separator has long been an essential feature in brass foundry equipment. This type of machine works on the principle that the magnetic machine picks up all the iron and steel, leaving good clean metal or metal with harmless impurities which will float on top of the mass when melted.

This type of machine as we have shown is fairly well known, but this is only one type. Another use to which the magnetic separator is put and where the result aimed at is entirely the reverse is in recovering iron scrap from useless refuse. In the first type the aim was to save everything but the iron, while in the second the aim is to save nothing but the iron. In a foundry visited by our representative a few days ago the chop from the cupola and all the scrap from the gangway was ground up in an old-fashioned stave mill which recovered the coarse metal. The finer metal which with the ground cinders passed through between the staves was all put through the magnetic separator, with surprising results. The amount of good iron which was recovered in this manner would amount to many tons in a year and would soon pay the cost of installing the magnetic separator.

The Use of Autogenous Welding in the Foundry

Showing the Various Gases Used in Conjunction With Oxygen in the Different Systems Which Lead Up To the Oxy-Acetylene Process of Welding and Cutting

BEFORE introducing the subject of oxy-acetylene and its uses in the foundry it will be as well to explain that it fills two very important positions which might be said to be exactly opposite to each other, viz., cutting or separating and welding.

Surplus metal can be removed from a casting with the same ease that a damaged casting can be repaired. The cutting process is so simple that it will not be necessary to go into any details, as the torch is simply applied to the metal and it melts and runs away. The force with which the flame strikes the metal is effective and the cutting is done directly in front of the flame. As soon as the metal becomes red hot a pure oxygen flame is used which unites with the carbon of the metal similar to a Bessemer converter. If a narrow slot is to be cut in the metal a narrow flame will cut it almost as accurately as it could be done with a tool.

The flame from a properly managed oxy-acetylene torch is equal to that of the electric spark and will cover a much greater territory. While the electric spark has its place in the industrial field it is not an opponent or competitor with the oxy-acetylene torch.

Welding by the oxy-acetylene process is known as autogenous fusion which in simple language means self-produced fusion or in other words the parts are melted and run into each other without any further work being done to unite them. Welding wrought iron on an anvil is simply heating the parts until they are almost melted and then pounding them together with a hammer, but when done they are still two pieces fastened together. With autogenous fusion the two pieces are made one as effectively as though melted and re-cast. The application of autogenous welding by oxygen used in connection with acetylene or hydrogen, benzol, gasoline or other hydrocarbon vapor to commercial purposes has extended enormously during the past few years, and construction work is now possible by its use which could not be carried on by any other means. Thus repair work of ferrous and non-ferrous metals is now done in every town of importance, and tubes of all sizes are made on a very large scale. Of course, it is used for innumerable jobs besides foundry work. For branch pipe construction the process is quite unrivaled. For high-pressure steam-pipes the joints after screwing are often welded up, and tanks of various kinds, instead of being made with folded joints are now made with the blow-pipe more cheaply and far more efficiently.

Lead burning forms an excellent practice for acetylene welding, as it is fusion welding in the simplest form. It is usually carried out with hydrogen and air, and if the workman can make a good joint with or without a stick of lead, it is a very easy step for him to advance to making one of aluminum or steel, or any metal.

First Application of the Process

It is claimed that an Englishman by the name of Fletcher was the first to introduce autogenous welding. This was only about 30 years ago, but even at that late date it had no commercial success. He used coal-gas and oxygen, but the coal-gas had not sufficient heat and the oxygen was not of good quality. In addition to this his blow-pipe was not very perfect and he had difficulty in maintaining a uniformly reducing flame.

It is the intention, hereafter, to devote a section each issue to oxy-acetylene welding and cutting, as we believe there are few places where it is used to better advantage than in the foundry. This introductory article shows what led up to the present perfected methods of working with this valuable addition to the sciences. In the next number we will endeavor to go more extensively into the chemistry and other characteristics of the system and show how to advantageously make use of it in the foundry.—EDITOR.

The first practical success with fusion welding was obtained by the late Felix Jottrand of the Oxyhydric Company of Brussels, who also introduced the first commercially successful application of oxygen for cutting purposes which, however had previously been demonstrated by Fletcher.

Jottrand's success was undoubtedly due to the fact that he used gas of high quality made by the electrolysis of water, and his blow-pipe, though complicated, was very efficient. Benzol, gasoline and other hydrocarbons have been recently used in connection with oxygen in place of hydrogen or acetylene for autogenous welding, and in some cases they make a fair substitute when the proper gases are not obtainable.

Oxy-Hydrogen Flame

This process, when employed at all, is generally confined to localities where oxygen is produced by the electrolytic process, and the hydrogen is a by-product. When oxygen combines with hydrogen at the nozzle of a blow-pipe, steam is formed. This steam becomes superheated in the flame and is finally decomposed or dissociated. This dissociation abstracts heat from the welding flame and limits the temperature to about 4,000 degrees Fah. The decomposition of the steam introduces another serious factor—the presence of this free oxygen, which oxidizes the metal operated upon. This can only be overcome by using a large excess of hydrogen. Only two volumes of hydrogen are required to one volume of oxygen to form water, but in actual practice, when employing an oxy-hydrogen blow-pipe, it is found that four or five volumes of hydrogen are required for one volume of oxygen in order to insure a non-oxidizing flame. This in itself will cause the process to be wasteful as the heat is limited to the amount obtained by combining two volumes of hydrogen with one volume of oxygen. Practice has shown that the oxy-hydrogen process is limited only to the welding of thin sheet work. The temperature of the flame is not sufficiently high to permit the welding of thick plates or castings, since the flame has to be applied for so long a period that before the necessary fusion point is reached the metal being operated upon is ruined.

Oxy-Coal Gas Welding

This process is seldom used owing to the comparatively low temperature obtained and to the fact that the impurities in ordinary illuminating gas have an injurious effect on the metals being welded. Owing to this fact the welds obtained in iron and steel are not so reliable as those made by other systems of fusion welding and the applications are limited.

Oxy-Acetylene Welding

This system of autogenous welding has preponderating advantages over all the other systems of uniting metals by heating without hammering or compression. While this has been accomplished by employing hydrogen and other gases, combined with oxygen, the high temperature of the acetylene flame makes the oxy-acetylene by far the most efficient process.

The highest temperature of the best fuel furnaces is about 3,000 degrees Fah. The oxy-hydrogen, which has the hottest of the gas flames, is less than 4,000 degrees Fah. The oxy-acetylene flame surpasses this by more than double the hottest solid fuel heat known and approximately the same temperature as the electric arc.

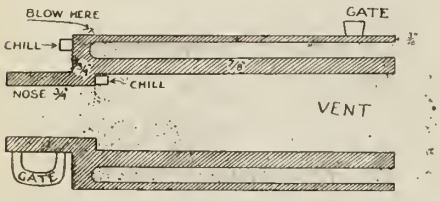
(To be Continued)

INDIA'S METALLURGICAL INDUSTRY IN ANCIENT TIMES

The head of one of the largest industrial companies in India estimated that the country had sufficient iron ore to last for thousands of years. India is also well off for the necessary fluxes for the manufacture of pig-iron. The country therefore should be in an excellent position for the manufacture of iron and steel and the products of those metals, within limits. Iron smelting has been practised in India from very early times. Mr. Lees Smith in one of his books on Indian economics states that the manufacture of steel and wrought-iron had reached a high state of perfection at least two thousand years ago, and that famous iron pillar at Delhi, which is not less than 1,500 years old, is still a marvel. It consists of a mass of wrought-iron, the like of which in modern times could only have been produced by the largest factories. He further says that the famous Damascus blades were finished from iron brought from a remote Indian village which has now passed into oblivion. Indian steel was at one time used for cutlery even in England; yet, at the present time India in a commercial sense is only at the beginning of an iron industry. Thus does history repeat itself.

TROUBLE WITH GASOLINE CYLINDER

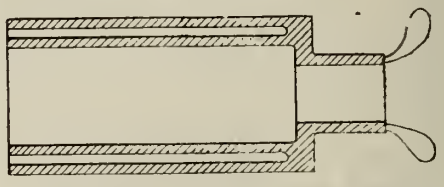
Editor:—I am enclosing a sketch of gasoline cylinder which is giving trouble. I am not the foreman, but just the molder who is doing the work and I have my own views which are not exactly in accordance with those of the foreman, but will leave it to you to decide.



GASOLINE CYLINDER WHICH IS GIVING TROUBLE.

Formerly we gated them on the joint but they came dirty, so we changed the method and now gate them with a flat gate on top and have overcome the dirt difficulty, but now they blow at the point marked "blow." I contend that the gate forces the gas to this point and causes it to "kick." The heavy spots marked "chill" are part of the casing which must be there but they are out of proportion to the rest of the casting and when we made them in the green sand they used to shrink, but by using the chills we have overcome this trouble. I don't think the chills have anything to do with the blow. The cores are made of pure silica sand and oil and are so porous that they can be blown through. If it is not the gate that is making the trouble I do not know what it is. Can you advise me?

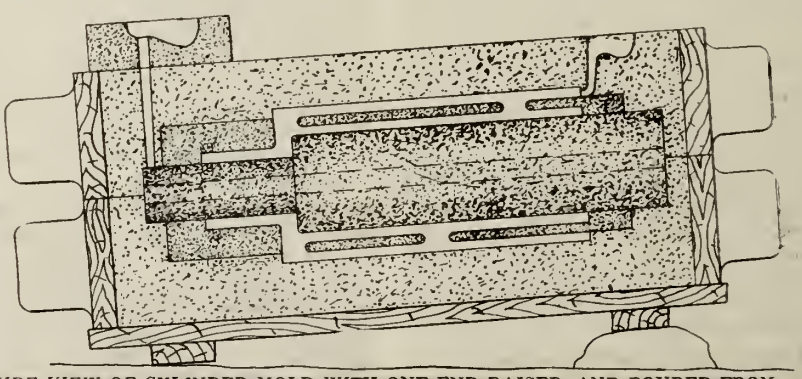
Answer:—Personally I do not favor that method of gating a cylinder, and do not consider that it could be successfully followed on anything but small cylinders as the metal would follow the core until it passed the biggest part when it would fall on to the green sand of the mold and cut it. However, if the castings are coming sound in every respect excepting the blow I cannot agree with the argument that the gate has anything to do with it. If, as you say, the incoming iron forced the gas to this point it would act the very reverse to what it is doing. The greater the pressure which can be created on the outside of the core the less chance there is for the gas from the inside of the core to escape by any means excepting that which was provided. If you will study two fundamental principles which the foundryman has to contend with and which are prominent in this particular instance, you will see what is causing the trouble. One of the principles is that the gas which invariably forms when the hot metal comes in contact with the core will rise in preference to going in any other direction unless some force is brought to bear upon it to hold it back. The other is that ordinarily the amount of sand and binder required to make the core will not generate any more gas than the amount of metal over it will hold back. From this I mean to say that usually a light casting only requires a light core. In the case of a gasoline cylinder, it is a very heavy casting with a thin core surrounding it, which is in turn covered with the thin shell of metal. If the jacket core had no metal to contend with but the shell which surrounds it there would not be enough gas created to cause any trouble. As it is, with the mold level, the inside of the jacket core is subjected to the melted metal before the thin shell over the top of it is. Gas forms and when the iron flows over the top a little puff takes place and the inflowing metal would have a tendency to force it to the opposite end. The jacket being light sets before it has time to undo the damage caused by this puff. If you gate the cylinder as I have shown and have the other end raised a couple of inches you will get a clean casting, equal in every respect to what you are getting and when the iron begins to flow over the jacket core there will be no puff as only a small portion of the core will be covered at first and this will be added to until the entire mold is filled. It is never a good policy to have a straight casting poured the entire length at the same time. By having one end raised and by pouring from the lower end a sounder casting is secured, and by having the open end of the core the highest the gas will find its way out much more readily than if on a level.



TOP VIEW AS IT SHOULD BE POURED.

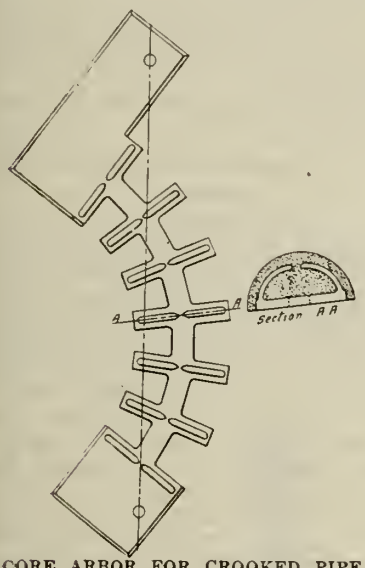
MOLDING CROOKED PIPE WITH GREEN SAND CORE

In molding a quarter turn pipe coupling, commonly known as an elbow, one method is to have a solid pattern and a core box. The core is made and dried. After making the mold the dry core is put in place with chaplets on all sides to keep it in place. Another method is to only dry the bottom half of the core and make the top of green molding sand. By standing a piece of inch stock core of proper length in the core box when making the green half, it will bear on the dry half and up to the top of the green half and will hold the top chaplet and not allow the chaplet to crush the green sand. Another way, but a doubtful one, would be to have all the core green sand and place it in the mold in a similar manner to setting the dry core, but the way which I purpose describing is to make it from a split, hollow pattern, making the core and outside of the mold in one operation and not having any separate core made in a core box. This can be done in more ways than one. One way would



SIDE VIEW OF CYLINDER MOLD WITH ONE END RAISED, AND POURED FROM LOWER END.

be to have both halves of the flask barrel and use each one in its turn as a cope. Another, and the one which I will describe, is to make it in an ordinary mold and only roll it once. The arbor will be shaped like the sketch, Fig. 1. If the reader will follow closely it will be possible to understand the process without any further engravings. A smooth board is used to begin with. The arbor is placed as shown and half the pattern is placed upon it. A little sand is tucked in at each end to allow a parting to be made from the board to the line of the pattern. No attempt is made to tuck sand in with a view to making the core. The parting is made to separate what will be the core from the main body of the mold. After making these partings the mold is proceeded with by the usual process of ramming the drag and rolling it over. After rolling over, sand is sifted onto the arbor and tucked in with the fingers in a similar manner to tucking the bars in a cope. The entire half pattern will be tucked full of sand and left rough. The top half of the pattern will now be put on and sand rammed into it with a ramming stick. Before doing this it is well to lay in a curved rod which will later be withdrawn, leaving a vent hole. Partings will now be made on the ends of the core. The flat parting for the point of the mold was, of course, made



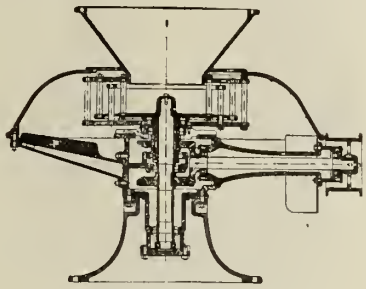
CORE ARBOR FOR CROOKED PIPE.

at any convenient time. Parting sand will now be put on and the cope rammed up and lifted off. After removing the half pattern and finishing the cope, the green sand core will have to be removed in order to draw the bottom half of the pattern. The rest of the work will be straight ahead molding.

The arbor as will be seen is an ordinary fingered arbor inside of the pattern. Beyond this it is flat and has beveled edges so that it can be drawn from the mold and replaced in the exact position without damage to the mold. It will also be noticed that at one end it projects to one side in order to bring the draw holes at the ends to come in line with the center of gravity. This extra projection also serves to hold the core in positon, preventing it from sagging or lifting.

NEW PATENT SAND MIXING MACHINE

A new sand mixing machine entirely different from anything heretofore put on the Canadian market has been recently brought out by Alfred Herbert Limited of Coventry, England. This machine while new in Canada is the culmination of several ideas in sand mixing in this company's foundry



CENTRIFUGAL SAND MIXER.

in England. The original object in manufacturing the machine was to get properly mixed sand for their own work, and after arriving at the present state of perfection it was decided to put it on the market.

The machine will deal with sand at the rate of about 7cwts. per minute, or as much as two men can shovel in.

The action of disintegrating and aerating sand by this method can be seen from the line drawings here shown.

Four internal metal cages, revolving in reverse directions to each other, cause the sand, when thrown into the hopper, to be flung in an outward direction.

The sand upon striking the bars of the first cage is flung tangentially on to the bars of the remaining cages, consequently breaking up and thoroughly mixing the sand.

The machine is not built in the rough "good enough for the foundry" way too frequently found to be the case, but is constructed for long life and durability. All the gearing is of steel case-hardened, and all the bearings are single-track ball bearings. The gearing and bearings run in an oil bath, and are thoroughly protected from the entrance of dust or sand. The cages are of steel, and the bars are arranged so as to be easily renewed.

The countershaft has self-oiling bearings and runs at a moderate speed, so that although the cages run at a high speed the line-shaft pulley need not be unduly large.

These machines are carried in stock by Alfred Herbert, Limited, at their Canadian show-rooms, 1-3 Jarvis street, Toronto. Literature illustrating and describing the machine more fully can be had on request.

Locating in Kitchener.—The American Ironing Machine Company, Chicago, will establish a Canadian branch of their business in Kitchener. Already an agreement for the lease of the worsted spinning factory has been completed, and the company will commence installing the machinery the first of March, with operations commencing April first, 1921.

LIKES McLAIN'S SYSTEM

Editor Canadian Foundryman: — Like many other molders I have from time to time seen advertisements in various papers on the subject of melting and mixing iron and semi-steel by the McLain system, but always dismissed them from my mind until the course of events brought home to me the great need for improvements. Hence I made up my mind to get into it with all possible speed. I decided to take this course in scientific melting, and try it out.

If it were possible for me to approach every molder in this Dominion and the States, I would be on the job, but since this cannot be done, I am doing the next best thing by using the columns of your publication to impress upon all molders that if they have any desire to dignify the profession to which we belong (and there is dignity in honest labor) to do as I have done.

After Becoming Foreman

Being in charge of a foundry demands the best one can do with the equipment to hand and materials supplied. But when these are not what one could wish for the foreman is up against it, and the morning after the night before's cast reveals to us results we did not wish for.

If these conditions are yours, don't hesitate. McLain's system will help you as it helped me, because it starts one to think and use the powers we possess to better advantage, and when molders begin to study their lessons it is then they will make good. The lessons in the McLain system, twelve in all, are concise and are in such simple explanatory form that any one of us can soon grasp them.

I have read most all books on foundry but nothing has helped me to help myself like these lessons. If the cupola is not right or if I have no pig iron I know just what to do, and I get good sound castings out of junk and scrap iron, and believe me the worry and anxiety which cannot be counted in dollars and cents are removed. The machinists are not howling about hard spots and blow holes and the molders, the foreman and the boss are on better terms with each other on account of getting results which do not require fault finding. I might write columns but will close with the following data. Previous to taking the McLain course the cupola was one of the many such as are used in most foundries and before alterations which cost but a trifle compared with the results I was melting 2¼ tons an hour; now with less coke I am melting 3 to 3½ tons, hotter and better.

Aim to be a Top-Notcher

Anyone can remain at the bottom, but there is room at the top and with a proper knowledge of scientific melting there is a straight path leading to the top. McLain's system will help you to attain it.

Yours truly,

BRITISH COLUMBIA.

P.S.—Please do not publish my name, but you may refer correspondents to me.

The construction of work on the plant of the W. R. Cuthbert Company, manufacturers of brass goods, has been completed, and the installation of the machine and moulding equipment is being rushed. It is expected that the plant will be in full operation before the close of April.

Malleable Castings vs. Grey Iron and Steel

Ability to Stand Abuse, Static and Dynamic Strength, Ease of Machining, Smoothness of Surface—Properties and Limitations Of Malleable Iron Castings

By ENRIQUE TOUCEDA

Malleable iron castings, according to the author, are regularly made weighing as high as 500 lbs., with an ultimate strength of 50,000 lbs. per sq. in. and an elongation of ten per cent. or over. With these properties in mind he compares such castings with grey iron and steel castings, showing that with respect to the former the malleable casting has equal physical properties, costs no more, is lighter in weight and is not liable to breakage. More than 70 per cent. of the steel castings produced, it is stated, are not annealed and are in a state of internal strain. Annealed malleable castings are free from such strain, are less expensive to produce, and in the author's opinion will stand more abuse in service. Their use is therefore indicated and recommended for any part of such size as can be successfully made where strength combined with ductility and low cost per pound is essential.

IN GENERAL, the selection of the proper kind of a ferrous casting for use in a given piece of construction is dependent upon a number of considerations, chief among which may be mentioned the following:

a Ability to successfully withstand the abuse to which it will be subjected in service.

b High static and dynamic strength, which implies minimum sections for the strains involved, this in turn implying low cost for raw castings, as such are not only less costly in direct proportion to their strength, but their appearance is enhanced thereby.

c Ease of machining, accompanied by a good surface on faced and turned parts, and freedom from unsoundness; which implies beauty of finished castings and low cost due to less loss from defective castings.

d Smoothness of surface, and trueness to pattern.

2. In discussing the above a fact should be remembered that is frequently overlooked, viz., that the gray-iron, the malleable-iron and the steel casting have each a legitimate field of their own quite sharply defined by virtue of certain peculiarities possessed by each particular product. If a bedplate is desired for a certain large and ponderous machine, so dimensioned as to possess sufficient mass to enable it to absorb vibration, it would be unwise to specify that it be made of malleable cast iron. The malleable-iron founders are not at the present time equipped to cast and anneal castings of such size, and as cheapness and weight—obviously not high strength per square inch—are the dominant requirements in this case, the malleable-iron casting should not be specified. The same remarks hold good in the case of the steel casting, except of course that it is practical to make such castings as large as any made of gray iron.

Gray-Iron vs. Malleable-iron Castings

3. The true legitimate field of gray iron, in the writer's opinion, should and will in time be restricted to the production of that size of casting that cannot successfully be produced in malleable iron and is too costly to produce in steel, while it is peculiarly well fitted for such castings as are designed to sustain static compression, for which purpose the gray-iron casting is without question superior to either of the other two. The average ultimate tensile strength of the gray-iron casting as measured by the test bar does not exceed 20,000 lb. per sq. in., while it possesses practically no ductility. The writer can state with positiveness that in the case of at least sixty of the malleable-iron foundries the average ultimate strength and elongation of their product, as measured by the standard test bar, are 51,000 lb. and 12.50 per cent. respectively.

4. It can safely be stated that if a gray-iron and a malleable-iron casting are designed to perform the same function, the design of each being based strictly upon its physical properties, in view of the great difference in their relative strengths, coupled with the fact that a larger safety factor must be used in the case of the former due to its inherent brittleness, the latter can safely be made more than one-third lighter. Inasmuch as this difference in weight will in large measure counterbalance the difference in cost per pound with the substitution of a ductile casting for one that is brittle and is actually more easy to machine, the writer believes that when this fact is fully understood and its significance appreciated, many castings now made of gray iron will be replaced by malleable, with the result that the gray-iron casting field will of necessity be narrowed to this extent. It is therefore logical to conclude, as between these two products, that if the part can be successfully cast of malleable iron, the following statements hold true:

a For equal physical properties it is as cheap per raw casting.

b It is as cheap per machined casting.

c It will have a more pleasing appearance when assembled.

d It will be lighter in weight.

e Transportation charges will be less.

f The weight per square foot on the floor will be less.

g Breakage during transportation will be eliminated.

TWO ILLUSTRATIONS OF THE SAME MALLEABLE IRON CASTING BEFORE AND AFTER COLD BENDING UNDER THE HAMMER.

Steel Castings vs. Malleable-Iron Castings

5. If the same line of reasoning be used as between the malleable iron and the steel casting, it can be stated at the start that neither can successfully trespass in certain directions in the field of the other, for each, as will be explained, has certain limitations that control the situation. There is hardly a limit to the size or weight in which the steel castings can be made, while as previously pointed out there is a limit in the case of malleable iron. On the other hand, there are castings that can be very nicely made of malleable iron that cannot well be made of steel, using the same pattern. When such is attempted, it will be found that the steel founder will request that he be permitted to thicken the sections in order to allow for the lesser fluidity of his metal.

6. The American Society for Testing Materials standard specifications for steel castings deal with two classes: Class A, for which chemical but no physical requirements are specified and which need not be annealed unless so specified; and Class B, which is divided into three grades, hard, medium, and soft, it being specified that all of these grades shall be properly annealed, and also conform to certain chemical and physical requirements. While the ultimate strength of both Class A castings and the soft grade of Class B castings may average higher than that of malleable iron, their yield point will average lower by some 4,000 lb. Consequently for

EXAMPLE OF COLD BENDING IN A HEAVY MALLEABLE IRON CASTING.

equal stiffness the malleable-iron casting has an advantage in the case of equal sections.

7. Inasmuch as the A.S.T.M. Specification for Class A castings states that they need not be annealed unless so specified, it is to be expected that the majority of these castings do not receive that treatment. This means the presence of internal strains in such castings, minimized to a certain extent, however, if baked molds are used. The writer knows of quite a number of large steel-casting companies that turn out a large daily tonnage of castings that are never annealed and assumes that in such cases they are made in accordance with specifications other than those of the A.S.T.M., and after considerable inquiry he has come to the conclusion that 70 per cent. of the steel castings produced in this country are not annealed.

8. It happens that the heat treatment given the malleable-iron casting during the period in which the white iron is being converted into the malleable product is carried on at a temperature just slightly in excess of the critical range, a temperature which yields practically the finest crystallization that the metal can attain, while the cooling from this temperature is effected at the rate of about 10 deg. per hr. In consequence of this the malleable-iron casting is not only fine-grained but is invariably free from internal strains. On the other hand, not only are unannealed steel castings in a state of internal strain, but they possess a coarsely crystalline structure corresponding to the temperature of solidification. In view of all this, the writer believes that if a given casting be made of malleable iron it will stand more abuse in service than will a similar unannealed steel casting.

9. If the cost of the raw casting is the dominant factor, then unquestionably preference must be given to the malleable-iron casting, as the difference in cost is considerable. If based upon the cost of the finished casting, the difference between the cost of the two will be much greater, due to the greater ease with which the malleable casting can be machined, which difference will vary directly in proportion to the amount and character of the machining operations.

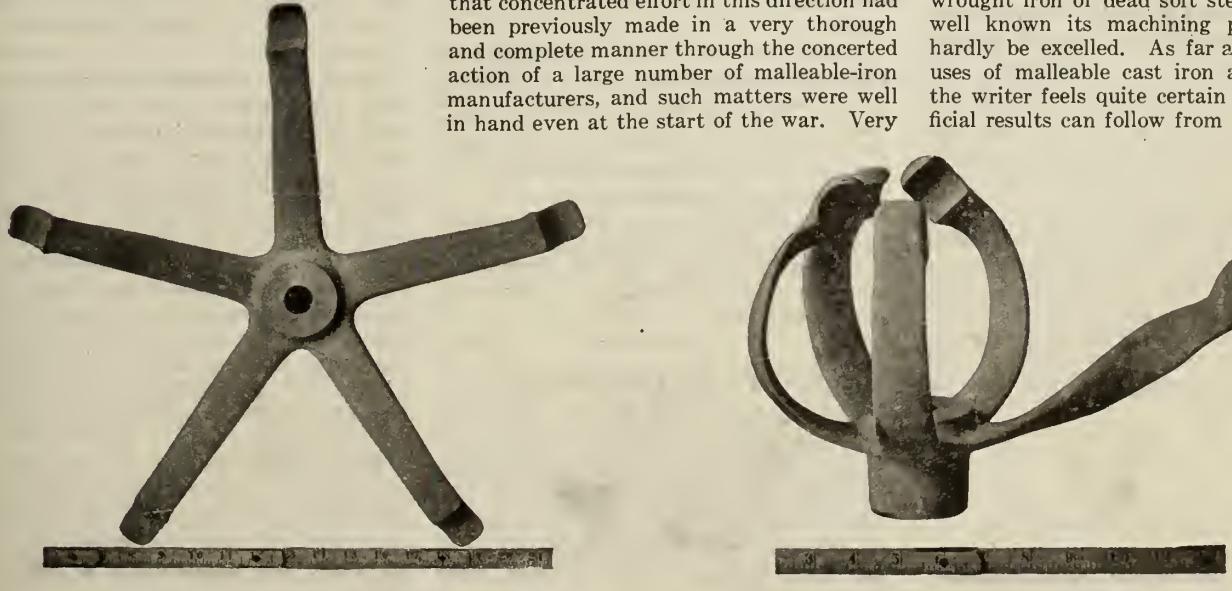
10. The malleable-iron casting is characteristically free from blow-holes, while this is acknowledged to be one of the shortcomings of the steel casting; consequently, there will be less scrap in the case of the former. If rust-resisting properties are a consideration, as in the case of castings for refrigerator cars, the malleable-iron casting should be given preference over steel.

11. Concerning the developments in the malleable-iron industry due to the war, it can be stated that none were occasioned along metallurgical lines, for the reason that concentrated effort in this direction had been previously made in a very thorough and complete manner through the concerted action of a large number of malleable-iron manufacturers, and such matters were well in hand even at the start of the war. Very few of the officers connected with the Ordnance Department were familiar with the physical characteristics of these castings, and the exigencies of the situation due to unpreparedness, coupled with the customary "red tape," served to a great extent to prevent those from substituting such castings for products with which they were acquainted. Owing to this the malleable-iron casting was not used for many purposes for which it was eminently fitted. As the product has not heretofore been used in connection with ordnance material, some development took place to this extent at least, for it was finally discovered by the Ordnance Department, at a rather late date however, that many castings formerly made of brass, bronze and steel could advantageously be replaced by malleable iron at a much lower cost. A very large tonnage was used in the manufacture of automobiles, trucks, tractors, tanks, etc., while a certain tonnage was used for hand and rifle grenades. Had the war lasted another year, the opinion is ventured that a large tonnage would have been used for various purposes aside from those mentioned.

Properties and Limitations of Malleable Iron Castings

12. In commercial practice the engineer who has placed his contract with a reliable foundry can depend upon a uniformity of product that will rarely have a yield point lower than 31,000 lb. per square in. and frequently as high as 33,000, an ultimate strength less than 50,000 lb., or an elongation less than 10 per cent. He can quite safely depend upon the integrity of the casting, for the reason that the founder has finally learned through costly experience that freedom from shrinkage depends not only upon correct gate emplacement, but more particularly upon the use of large shrink heads, so located as to eliminate such defects. Castings have been produced commercially as long as 5 ft., with sections at some parts as thick as 3 in. In regular practice castings varying in weight from 300 to 500 lb. are made daily, while it would be difficult to place a limit on how small they can be run.

13. The wearing properties of this metal correspond to what can be expected of wrought iron or dead soft steel, while as is well known its machining properties can hardly be excelled. As far as the ordinary uses of malleable cast iron are concerned, the writer feels quite certain that no beneficial results can follow from its heat treat-



ANOTHER EXAMPLE OF HOW MALLEABLE IRON MAY BE DISTORTED WITHOUT CRACKING OR BREAKING.

ment. In a limited number of cases, however, such as in the production of cheap hatchets, cleavers, and axes, malleable iron can be made file-hard by heating to just above the critical range and quenching.

Comparative costs of Gray-Iron, Steel and Malleable-Iron Castings

14. A general statement relative to the comparative cost of manufacture of the three products mentioned must obviously involve the consideration of many different cases and conditions. If it were not for the fact that in the case of the manufacture of malleable iron the annealing (which lasts from six to seven days and is a rather costly part of the process) must be taken into account, an approximate estimate could be made by figuring out the cost of the metal in the ladle for each of the three products; but the varying cost of molding in each case and the fact that the sprue can be easily knocked off from both gray and malleable-iron castings while it must be machined or cut off from the steel casting, render it rather difficult to make a comparison of the costs of the raw castings. In general, however, gray-iron castings run heavier than do those made of malleable iron. Consequently there is less sprue and therefore less remelt. Also there is less variation between the composition of the sprue and that of the charge and as a consequence a much larger percentage of scrap can be used in the mixture when making gray-iron than is possible in the case of the malleable castings. Assuming the highest fuel ratio in each case, 10 of iron to 1 of coke for the cupola, and 3 of iron to 1 of soft coal in the air furnace, it will be seen that the cost for fuel is less in the former than in the latter case. The same holds true in connection with furnace maintenance. Aside from cleaning and clipping, the gray-iron casting is finished when the metal fills the mold, while the white-iron castings must be cleaned, taken to the annealing room, packed in saggars, and then charged into the annealing oven and heat-treated for a period in most instances of seven days. The saggars must then be removed from the annealing oven, the castings again cleaned and sorted, to the cost of which must be added that of the fuel used for heat treatment, oven maintenance, supervision, and overhead. It can therefore be very easily seen that there must be considerable difference between the cost of production of these two products. The writer believes that on an average it will easily cost 1 cent a pound more to produce malleable-iron than it will the gray-iron castings, and at least 30 per cent. more to produce steel castings than malleable.

15. The malleable-iron casting is regularly used and can be recommended in the fabrication of railway cars, agricultural implements, motor vehicles, tractors, link belts, chain, fittings, stoves, etc., and is adapted for use for any part of such size as can be successfully made where strength combined with ductility is a necessity and low cost per pound an essential.

I love to watch a rooster crow,
He's like so many men I know,
Who brag and bluster, ramp and shout,
And beat their manly chests, without
A single thing to crow abou t.

CUTTING OFF A SUPER-SIZED RISER

The cutting of super-size risers sometimes presents problems that puzzle even the men whose daily work is dealing with these monsters of the foundry. The successful handling of such problems frequently brings out solutions of great practical value to the industry.

An example of this kind was illustrated at the plant of a large foundry company in Pennsylvania. This company has been handling heavy work for the past six or seven years, and the cutting of risers has been handled in various ways, the smaller cuts usually being made with oxy-acetylene torch and the heavier ones being placed in large lathes especially suited to the work.

However, it happened recently that the unusual and knotty problem—the unexpected difficulty—arose. The specific case was the cutting of a cylindrical steel riser 5 ½ ft. in diameter, 4 ft. long and having walls some 15 inches in thickness. The casting, together with the sand and cores, before cleaning, weighed ninety tons. It was an air compressor casting, and weighed sixty tons net, shorn of its riser, core and mould. Being too large for cutting in even the largest lathe, the oxy-acetylene cutters were assigned to the job; but their equipment and experience on the lighter work with which they were familiar were not equal to the task before them.

After hours of difficult effort the operator barely succeeded in driving the cut through to the inner surface, making a small hole in the riser. The failure to get the cut under way effectively was due primarily to the light torches used and to the fact that they were connected with a single oxygen cylinder.

This fault was finally overcome by connecting two oxygen cylinders in manifold and using a heavy service cutting torch. The cut was then begun at the outer edge of the riser, where the cutting could be started more readily, and a panel was cut out all the way back to where the final cut was to be made. This had the effect not only of facilitating the start on the major cut, but enabled the operator to better handle the cut throughout, as the panel opening made it possible to work from either the outer or inner surface at will. Two fifty-ton cranes were used to turn the work as the cut progressed.

Cutting with the heavy torch began at 5 p.m. Saturday and was completed the following day. The actual consumption of oxygen was about 7,250 cu. ft. Including the panel there was 25.27 feet of cut (outside circumference) through steel 15" thick. The riser as cut weighed nine tons.

This is interesting as showing a successful method of handling the super-cut under unusual conditions, and also as illustrating the emergency possibilities of the oxy-acetylene process.

RIVET CUTTING RECORD

What is believed to be the record to date for cutting rivets in the dismembering of steel freight cars was recently established by an operator who cut out 1,038 rivets in 2 hours and 46 minutes. Of this number 683 were ⅝-inch rivets; 228 were ¾-inch rivets; and 127 were ⅞-inch rivets.

The cutting was done on a standard Erie car under general yard conditions, the operator taking the rivets as they came, working inside, outside and under the car. The car was one that had been retired from active service and that was in the car shop for repair, the rivets and plates being covered with heavy scale and rust, thereby rendering the cutting extremely difficult.

It is said that the record applies not only to the number of rivets cut in the time required, but also to the low consumption of gases used, the job taking only 384 cubic feet of oxygen and 83 cubic feet of acetylene. The operator used an Oxweld cutting blowpipe, with a rivet cutting nozzle.

WILL DOUBLE PLANT CAPACITY

Smiths Falls.—The recent re-incorporation of the Smiths Falls Malleable Castings, Limited, the second oldest malleable castings concern in Canada, is in line with a proposed broadening out policy and programme of expansion.

The company was started in 1878 by Wm. H. Frost and Chas. Jones with a capital of $2,500. Six years later the latter partner sold his interests to Mr. Frost, who with J. Edwin Frost, the present secretary and director, carried on under the name of the Smiths Falls Malleable Iron Works until 1902, when the Smiths Falls Malleable Castings Company was incorporated.

The business had grown from a mere infant with a cupola and a one-ton annealing oven to two plants covering the better part of two acres with an annual capacity of 8,000 tons and employing 250 men.

In 1906 the Rideau Malleable & Foundry Company, Limited, was organized by local citizens of the north end of the town and when the slump and business depression of 1907 came on, this plant was absorbed by the Smiths Falls Malleable Castings Company, Limited, thereby increasing the capacity by 3,000 tons annually.

Since the original incorporation in 1903 the company has operated on a capital of $150,000, but with the rising cost of manufacture it was found inadequate and also since they suffered the loss of three of their active firm members, viz., Wm. H. Frost and his two sons, Burton H. and E. Theodore, they felt the necessity of a reorganization and therefore incorporated a new company now known as Smiths Falls Malleable Castings, Limited, with an authorized capital of $750,000, which company bought out assets, goodwill, etc., of the old company.

The present officials of the company are Geo. B. Frost, president and general president and treasurer; J. E. Frost, secretary and sales manager, all three directors and constituting a managing board.

Items of Interest to the Brass Foundry

BRASS FIXTURES, INCLUDING LOOKING GLASSES

In different parts of the Scripture we read of looking glasses but this probably is accounted for through translating the Scripture from the original into the English language, as it is doubtful if the ancients had either looking glasses or any other kind of glasses in the sense that we take it. Anything transparent would be described by a word which if translated into English would be glass, while anything which would reflect back the likeness of anything placed before it would be described by a word which if translated into English would be looking glass.

In the Book of Job we read where Job was cursing himself and everything which came in his way and Elihu, one of Job's comforters, in endeavoring to show him some of the beautiful things in creation referred to the sky and compared it to a molten looking-glass. A looking-glass as we know it, would not present a very beautiful appearance if melted. As a matter of fact the looking-glass of the ancients was without a doubt, the work of the foundryman and was of polished brass. It was however used for the same purpose as it is to-day—for ladies to adorn themselves before.

If we refer to the book of Isaiah we find the prophet foretelling the inhabitants of Jerusalem the calamities which are about to befall them on account of their reckless way of living. He told the ladies that the Lord would take away the bravery of their tinkling ornaments about their feet, and their cauls, and their round tires like the moon, the chains and the bracelets, and the mufflers, the bonnets, and the ornaments of the legs and the headbands, and the tablets, and the ear-rings, the rings, and the nose jewels, the changeable suits of apparel, and the mantles, and the wimples, and the crisping pins, the *glasses* and the fine linen, and the hoods and the veils. And it should come to pass, that instead of sweet smell there would be stink, etc.

This was to befall them because they were haughty, and walked with stretched forth necks, and wanton eyes, walking and mincing as they go, and making a tinkling with their feet.

If we go back to the days of Moses, when he was leading the Israelites out of the land of Egypt and when he was fitting up a sort of portable tabernacle, we find that he used an enormous amount of gold for the altar and its appurtenances, but for some of the less sacred articles of furniture he used brass. Thus, he made the altar for burnt offerings of wood, overlaid with brass. And he made all the vessels of the altar, the pots, the shovels, the basins, the flesh-hooks, and the fire-pans of brass. And he made for the altar a brazen grate of network, and he cast four rings for the ends of the grate of brass, for the staves to fit into, and he made the staves of wood and overlaid them with brass.

Now comes the interesting part. He made the laver of brass. A laver is what we sometimes confuse with the word lavatory. A lavatory is the room in which a laver is installed, while a laver might be a wash basin, a bath tub, or a swimming pool. A laver for use in a tabernacle was usually a brass vessel, containing water for the priests to wash their hands and feet in when they offered sacrifice. It rested on a base, or foot, and on this foot would sometimes be placed a looking glass. The laver usually stood between the altar and the door.

However Moses made the laver of brass, and the foot of it was of brass, and the looking-glasses for the women assembled.

From this it will be seen that the ancients were well up in the art of working in brass. Copper would not make a very successful mirror so we must conclude that they used an alloy. If zinc was unknown in those days, as we are told it was, they probably were acquainted with the copper-tin mixture which we call bronze. Certain it is that copper and tin can be mixed to produce mirrors and it is a wonder that it does not occur to some enthusiastic non-ferrous metal man to start a fad along the lines of brass looking-glasses.

ALUMINUM BRONZE

Question.—Will you tell me what aluminum bronze consists of and what are its usefulnesses? I am told that it has no particularly useful qualities excepting in the manufacture of jewelry, and again I am told that it is valuable for machinery brasses.

Answer.—Aluminum bronze is a combination of pure copper and aluminum, usually in the proportion of 9 copper and 1 aluminum. Until recently this was considered a cheap substitute for gold and was used extensively for watch-cases. Very little attempt was made to use it for general purpose brass goods on account of aluminum being a supposedly rare metal. Aluminum is the most plenteous metal on the face of the earth but this was not known, and what aluminum was refined was so expensive that its usefulness was not considered equal to its cost. Since it has been found to be in abundance and the cost of production has been simplified considerably it has been found to be a very useful alloy. One of its features is that it will permit of iron being mixed with copper. Iron would mix readily with copper if it were not for the carbon in the iron which will not mix with copper. By mixing 16 per cent. of aluminum with 65 per cent. of copper it is possible to mix in 20 per cent. of common cast iron and make an alloy which is said to have valuable qualities where great strength and durability are essential. It has one disadvantage in that it does not make a dense bronze which will resist hydraulic or steam pressure, thus causing it to be condemned for such work as valves and fittings. The aluminum in the alloy shrinks away from the other metals leaving the resulting casting slightly inclined to be porous.

WILL MAKE DIE CASTINGS AT SARNIA

The H. Mueller Manufacturing Company, Limited, who manufacture castings and forgings in brass, bronze, aluminum, and nickel silver in their Canadian plant at Sarnia, and who operate a similar plant on the American side of the river at Port Huron, where in addition to the lines turned out of the Sarnia plant they manufacture brass rod, brass and copper tubing and die castings will begin the manufacture of die castings at the Sarnia plant. It is also their intention to manufacture the rod and tubing in Sarnia but some of the work will be done at the Port Huron plant. The idea is to cast the billets at Sarnia after which they will be taken across the river where a small amount of work will be done on the heavy machines which they do not feel like duplicating at present. They will then be returned to Sarnia where they will be finished. Not over 4 per cent. of the work will require to be done in the United States but this 4 per cent. will save the installation of expensive machinery while the business is being worked up. As soon as business warrants the expenditure, the necessary machinery will be installed in the Sarnia plant.

WANTS BEARING METAL

Editor Canadian Foundryman:

Is there any way of judging good bearing metal from the scrap brass pile? I have always considered that the yellow brass was the best for this purpose while the more reddish metal was more suited for valves, etc., but I have been told that I am wrong.

Answer.—Since tin has become so expensive the aim has been to make cheap mixtures to imitate the copper and tin alloy commonly known as bronze, so that now it is a difficult proposition to tell what is in the scrap without a chemical analysis. However, I must say that yellow brass does not make the best bearing metal. The reason that some brass is yellow and other brass is red is because copper mixed with zinc requires from 30 to 40 per cent. of zinc to be effective, while copper mixed with tin requires about 10 per cent. of tin. From this it will be seen that yellow brass is yellow because it has such a large proportion of zinc, and zinc has no good anti-friction qualities and does not wear well. Copper and tin mixtures have both wearing and anti-friction qualities. Copper and tin mixtures will carry a certain amount of lead without injury and will appear lighter in color than ordinary red brass. Lead does not mix chemically with the copper and tin but is held like water in a sponge and being a first-class anti-friction metal in itself it helps the bearing from that standpoint, while the copper and tin hold up the load.

Students' Course—Cores and Dry Sand Molds

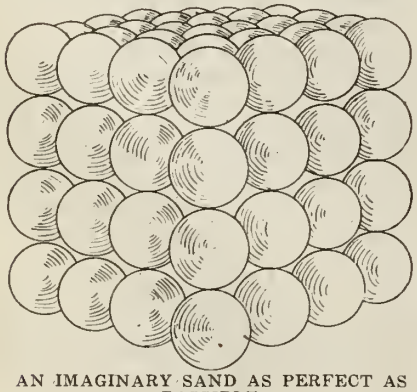
Showing Grains Taken From Photographs of Natural Sand, Also Demonstrating Effects of Bad Judgment in Selecting Ore Mixtures

By F. H. BELL

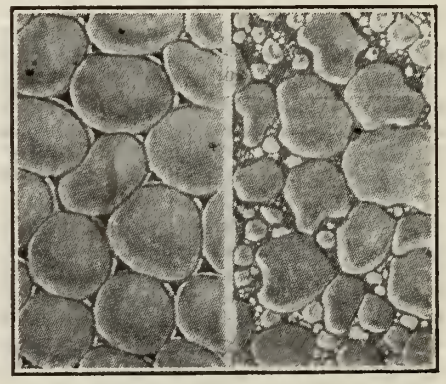
IN OUR former articles on sand and core work we showed perfectly round grains of sand placed as close together as it is possible to place them, but even then so open between the grains that it would be an easy matter to blow through the core after these grains had been stuck together with oil. We also saw the same kind of grains placed together in a similar manner but with the spaces all filled with molding sand effectually cutting off every avenue of escape for the gases formed when the core would be subjected to the heat of the melted iron. These perfectly round grains were of course not such as a core maker is called upon to use but I wanted to show the idea in its best and worst form. The sand here illustrated is taken from a photograph and is exactly what can be had in car-load lots or in any quantity. The grains shown while not perfectly round are to all intents and purposes the same as round and the same logic which applies to the round grains will apply to these. If sand of this class is perfectly dry and then has just sufficient linseed or other prepared oil mixed with it to be sure that each grain is oiled there is no use wasting any more oil or introducing any other form of filler. If any material is to be used to fill the pores the silica sand is wasted, as any other sand would have been just as good. The cores made from it would do for some classes of work but the work on which they could be used does not call for silica sand. If we take about 60 parts of clean dry silica and one part of core oil and mix them thoroughly in a muller or by some process which will insure a thorough homogeneous mixture every grain would have oil enough on it to make it stick to the next grain but the mixture might feel dry and not hang together very well when being worked, in order to make it work right water is added after the oil has been mixed through. The amount of oil required depends on the size of grain in the sand. If the grain is fine more oil would be required than for coarse sand because each grain has to be covered with oil. When real difficult work is to be done, the best is none too good, but when difficult work is to be done and we do not have the best material at our disposal it is possible to have success with what we have if proper judgment is used, and it is for this purpose that the apprentice should study the "why" of everything he does, so that when a job is presented at any time during his life he will know what course to pursue with the material at his disposal.

I remember working in a jobbing foundry where I was the only one who had ever been experienced in jobbing work. The rest of the men while good molders had served their apprenticeship in shops where everything was regular work and they just worked to the routine of the shop. Or in other words they were molders who required to have flasks fitted to the job and everything laid out for them before they could start on a job. I was not the foreman but I was in a worse position. The proprietor was his own foreman, and was a plate molder, so that I had all the responsibility and none of the authority. I had practically nothing to work with and we used to get some complicated work to do. I might say that I made the cores when any difficult ones had to be made. We had coarse sand which was dug out of a pit somewhere in the neighborhood. It went by the name of sharp sand but it was not very sharp, and in addition it had a tendency to be loamy. We used flour as a binder in most cases. Whenever we made a heavy casting which would burn the cores to a red heat I would save the burned core sand and put it away. This I used for oil cores. On one occasion a job came in for the head of a gasoline engine cylinder. The casting when finished weighed about six hundred pounds. The pattern was first-class, but we had no flask fit to mold it in and I had to make the best of building up old wooden flasks out of the yard until I got what would do. The design of the casting was such that the mold had to be made in three parts, but the molding was nothing compared with the core work. The head of a gas cylinder carries about all the mechanism of the engine. All the gas chambers are in it, and to keep the head from heating from the explosion of gas it has to have a water jacket all around and through it. The core for this jacket was about half an inch thick and shaped similar to a patent pail, with several holes through it and various ill-shaped projections added. The only place for the gas to escape was at the edge of the core where it made the opening to connect onto the cylinder and as this face had to be clean the pattern was made to mold so as to have this face down. I might say before going further that I advocate having my work as clean on the top as on the bottom and I made this with the face up and got it clean. Now for the cores. I took this burned sand and tempered it with core oil until it was about the same as flour mixture and I used no water. The walls of the core were about a foot high and would of course be hard to hold up while green so I sifted a big pile of molding sand in advance and as soon as I lifted away the portion of the core box which formed the inside I filled this at once with the molding sand. I then bedded on a core plate which was quite a bit too big. After rolling over and lifting off the balance of the core box I banked the outside of the core with molding sand before it had time to sag; the large diameter of the core plate making a bottom to hold up the sand. This was all put in the oven and baked, after which the molding sand was knocked off, leaving a clean hard core. I might say that before taking off the first part of the core box I vented the core with a needle wire wherever I found a straight place but nowhere else. By placing the core in the mold with the vent holes pointing upwards the risk of trouble is always lessened. However, the casting was first class. I made several more of them afterwards and never lost one.

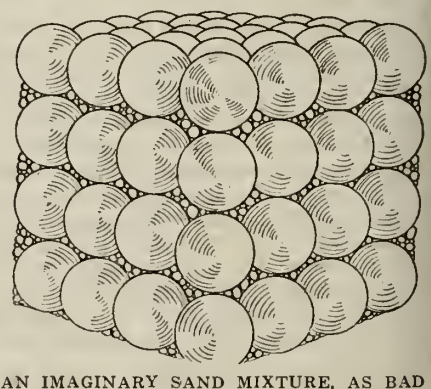
Later on I took a position in a large engineering works and this same job came there. It was not given to me and I never mentioned having seen it. An iron flask was made on purpose for it and the mold was made in dry sand baked in the oven. The cores were made by one of their best core makers but he made the fatal mistake of mixing molding sand into the oils and mixture in order to get the core to keep its shape. If they had made the job with the face up as I had done it might have helped matters but they made it as the pattern maker had in-



AN IMAGINARY SAND AS PERFECT AS POSSIBLE.



TWO GRADES OF SAND TAKEN FROM PHOTOGRAPH, ONE AS GOOD AS MY BEST AND THE OTHER AS BAD AS MY WORST.



AN IMAGINARY SAND MIXTURE, AS BAD AS CAN BE.

tended and then used this hard dense core with the result that it blew up when being poured. Another one was made in the same manner with the same results and then a third one was made with a proper core mixture and a good casting was the result.

I tell this story to demonstrate the advisability of study. Whenever a casting is to be made it must be remembered that melted iron has an effect on the mold and cores, and that the steam and gas must get out. If it is possible to arrange the mold so that the core vent can go upward it is advisable to do so. If not it is possible to force the iron downward but the core must be porous enough to let the gas pass through it without undue forcing. When that mold was made in such a manner that the vent from the core had to travel crosswise and then downwards, and only half an inch of melted iron over it to hold it, the gas would raise that half inch of iron before it would work its way down through a dense core. By looking at the two illustrations shown, or the ones in last month's lesson it will easily be understood how the gas would go in any direction through the one and how difficult it would be to get through the other at all.

Dry Sand

Dry sand molding is much the same as core work, although much simpler. In making the cylinder head just referred to I was forced to make it in a wooden flask and in green sand, while the other man had an iron flask and dried his mold. By drying the mold the steam which must form when metal comes in contact with a green mold is dispensed with. It also allows a lot of rodding and nailing to be dispensed with and gives the molder a better chance to use the rammer to make his mold secure. Dry sand usually consists of ordinary molding sand with some additional bond so that it will set when baked. Stronger or more loamy sand is sometimes used. This same result could be accomplished by putting clay wash in the molding sand. Before flour became such a luxury it was quite common practice to mix about one part of flour to twenty-five parts of sand and then blackwash the mold with a wash containing some molasses. Of late the rule is to use any core binder which gives satisfaction in the core room. The black core compounds which are used lately make good dry sand binders as they also act the part of facing, but unless this kind of mixture is baked at a temperature high enough to properly melt the binder it is worse than no binder at all as it only cakes after the casting is poured and leaves the sand heap full of lumps. If a glutrin binder is used a little goes a long way, and some glutrin water can be sprayed onto the face of the mold, and very successful work done if the casting is not too heavy. Dry sand molding is done the same as green sand molding with the exception, as we have shown, that the binder and the drying do away with the necessity of most of the gaggering which is required to hold a green sand mold together. The sand can be fairly damp and rammed hard without doing the harm it would do to a green sand mold, but it must not be done carelessly. If proper care is taken to vent difficult corners and pockets a better class of work can be done than in green sand. In fact castings weighing up in the tons can be made in dry sand and come out as smooth as stove plate.

NEW GYRATORY SAND RIDDLE

The Great Western Manufacturing Co., Leavenworth, Kansas, have arranged to manufacture in Canada their improved V Combs Gyratory Sand Riddle. The machine, as seen in the illustration, is electrically driven and is known as their type V. The following is what the company claims for the machine:

The construction of this machine differs materially from our original or Type H Gyratory Foundry Riddle, which has proved such a success.

There are no gears.

The frame is more rigid and strong. The design symmetrical and compact.

The weight has been reduced.

The motor is totally enclosed and all bearings made dust proof.

Only one bearing outside the motor.

The sieve is 20" in diameter and is held in place by an improved clamping device, which enables the operator to remove the sieve, dump and replace it in less time than it takes to tell about it.

The motor is one-sixth horse power, making the cost of current negligible.

Gyratory Motion

It has the true gyratory sifting motion, which gives the machine double the capacity of any reciprocating riddle of the same size. This gyratory motion is easy on the machine, every part gyrating in a circle with no stops, starts or jerks. There is always a steady pull in one direction. This lessens the repair bills.

Portability

The Combs Gyratory Foundry Riddle is the only really portable riddle made. It weighs about ninety pounds. A man can pick it up and carry it wherever needed. Just suspend it from any convenient support, screw the attachment plug into any lamp socket, and it is ready for business.

The time of employees is the most costly thing which enters into the cost of castings.

Every Saturday night when you pay off your help a liberal percentage of your payroll goes for time spent in screening sand.

The Combs Gyratory Foundry Riddle will save a big sum each week out of this payroll—so large a sum that it will pay for itself in a short time.

Capacity

This machine will sift sand faster than one man can shovel into it, and will also screen more sand than ten laborers using hand riddles.

Quality of Product

The Combs Gyratory Foundry Riddle mixes as well as sifts, saving one turning of the sand. Evenly mixed and tempered sand reduces the time of making the mould, and insures a better mould with fewer patches after drawing the pattern. This saving increases the output of each man, and the castings are truer to pattern.

Convenience

There are no legs to get in the way of the shovel. Run a wheelbarrow right under it if you wish.

When placed between two moulding machines, the Combs Riddle will supply each with plenty of sand.

It can be suspended over a flask, and the sand riddled right where it is wanted.

Brass foundries often suspend the Riddle from a trolley running on a wire cable stretched parallel with the line of moulders. The machine is pushed from one point to another as wanted, and as many as twenty men supplied with sand.

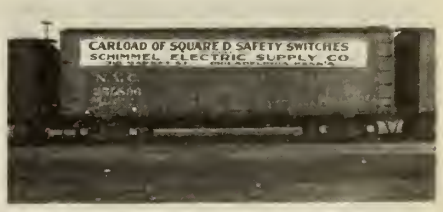
BUSINESS IS GOOD

Carload of Square D Safety Switches For Philadelphia

In the first nine months of 1920 defective open-knife switches and electrical equipment caused fires resulting in property damage of $653,434 in the State of Pennsylvania alone. In the same period 58 fatal and 291 serious accidents were caused from the same source.

When the figures for all states are combined the totals become appalling. Defective electrical apparatus, always the chief cause of fire loss, caused property damage amounting to $84,086,471 in the last five years.

Backed by the National Safety Council



CARLOAD OF SAFETY SWITCHES.

and fire marshals throughout the country, an organized movement is being made to eliminate electrical hazards.

The magnitude of this movement can be appreciated from the picture which shows a carload of Square D safety switches being shipped to one dealer in Pennsylvania.

The Schimmel Electric Supply Company of Philadelphia, who are receiving the carload, are confident that the electrical safety movement cannot help but reflect to the good of the electrical trade. Recent orders received for material of this kind are an indication of improved tone in the electrical industry throughout the country.

The Corundo Steel Co., Ltd., have acquired the old Record Foundry and Machine plant at 17 Mill Street, Montreal. The purpose of the company is to establish a factory for manufacturing cutting and percussion tools from low-grade steel and by a special chemical heat treating process convert it into a product equal in quality to high-grade tempered steel, suitable for a variety of conditions. Oscar Schenk is managing director.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—We have two nickel solutions which plate quite dark deposits, the color is dull grey and for certain pieces which we desire finished in simple white finish it is unsatisfactory. We want a lighter color, yet matte in appearance. Our nickel solutions are made of single nickel salt, table salt, boracic acid and sal ammoniac. Please let us know how to change the solutions so they will give us the whiter deposit. We would be pleased to have some information respecting the cause of the dull matte which we get now, we were under the impression that single salt solutions always produced white fine grained plate.

Answer.—Although you have not stated the quantities of the various chemicals used in your nickel solution we feel confident that you have an excess of table salt and sal ammoniac. Why do you use both in same solution? A reasonable quantity of either (2 or 3 oz. per gal.) should suffice for all ordinary purposes. Evidently you have too much chloride in the solution. Chlorides have a tendency to cause darker matter than sulphates when maximum safe current density is employed. If you operate the solution slower than at present you may be able to get a white matte. Keep the acidity as strong as your product will allow—and if you have less than three ounces of boric acid per gal. in solution you may safely add enough to make up the above amount in case color cannot be obtained by reducing current density. A nickel solution made from nickel sulphate, 2 lbs.; double nickel sulphate 1 lb.; magnesium sulphate, 4 oz.; boric acid, 4 oz.; water, 1 gallon, will yield a white fine grained matte deposit at temperature up to 100 degrees Fahr. This solution can be operated at 2 to 5 ½ volts and with current strength varying from 3 amp. per square foot to 20 amps. per square foot. Usually it is advisable to neutralize the acidity with nickel carbonate before using the solution. Neutralize the acidity while solution is warm.

* * *

Question.—We have operated a small plating plant for the past two years in a little town which supplies water from a small stream running nearby. The water has some properties which we believe are troublesome. Analysis of the water shows following contents, parts per million:

Sodium chloride, 22.4; calcium carbonate, 103.4; ferrous carbonate, 8.2; sodium sulphate, 5.5; magnesium carbonate, 43.3; organic matter, 10.6; calcium sulphate, 39.0; silica, 11.4; Total solids, 243.8

Some of the effects which we believe is caused by the water are—frequent clogging of steam pipes of small diameter, rapid corrosion of steam pipes at threaded joints. Thick white chalk-like scaly formation on inside of cold water rinse tank used after hot coppering in cyanide plating solution. Excessive amount of cleaning compound required to maintain good working condition of cleaning solutions. Can you suggest any practical method of treating the water so that we can eliminate these difficulties?

Answer.—The real offending element in the water appears to be the calcium salts and we do not know of any method you could use to free the water of this mineral other than treating the water in a large container before it enters the shop pipe line. Installation costs would be high. The damage actually resulting from the water is really confined to corrosion of water pipes, the scale on water tank may be easily removed when the thickness of scale is sufficient to permit use of sharp steel scraper. When repairing water pipes the threaded joints may be protected by dipping threads in an acid resisting hard enamel, or use galvanized iron pipe. For general use in plating tanks the water will not cause serious trouble, if boiled for few minutes and allowed to settle, some minor objectionable results are avoided. The temporary hardness may be overcome by careful use of sodium carbonate prior to making a solution. Steam pipe which clog as a result of using such water in boilers, should be relieved frequently by opening a steam valve on all lines not in regular use.

THE AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1920-1921.

President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

Question.—Kindly publish a formula which will produce a yellowish green on brass stamping, such as coat fasteners used on oilskin coats.

Answer.—Ammonium chloride 124 grs.; potassium oxalate, 31 grs., Dissolve in 16 fluid ounces of soft water. Use solution lukewarm.

* * *

Question.—Please inform me of the solution used to test zinc coating on iron, also comparative resistance to corrosion of molten and electric method of coating the iron, and positions zinc and copper occupy in the electric motive series. In practical commercial electro-plating is copper considered as good protection to iron as zinc?

Answer.—Use concentrated solution of copper sulphate, 24 degrees centigrade; specific gravity, 1.186. Test varies from 1 minute immersion to 5 minute immersion. Rinse and wipe dry. Comparative amounts of zinc used by molten and electric methods are: 0.25 oz. per square foot to 0.5 oz. per square foot by molten method, and 0.15 per square foot by electric method, resistance to corrosion being equal. Thus you will observe the tests are in favor of the electric method. In the electromotive series zinc is electro-positive to iron. When exposed, zinc is attacked first. Copper is electro-negative to iron. When exposed, iron is attacked first.

* * *

Question.—Do you consider the combination cleaning and coppering solution an economical and practical solution to use for copper plating general line of stamped sheet steel goods for culinary purposes, which are subsequently nickel plated? Is the copper deposit more liable to failure than is the case when cleaning separately?

Answer.—Personally we have great confidence in the combination electro cleaning and coppering method. It is a labor saving process, In our experience we have effected reductions in labor costs of over 100 per cent. in many cases. We have experienced absolutely no difficulty from failures owing to use of the combination method. The use of a soluble oil in polishing treatment previous to plating is a great aid in handling the work quickly and safely in plating department. If the work is badly coated with grease, oil or emery paste, it is advisable to use a soak solution composed of some strong cleaning chemicals before placing the work in the combination solution. Where very fine work is required and much dirt or grease must be removed three tanks are employed. No. 1—Soaking solution. No. 2—Electro cleaning solution. No. 3—Combination cleaning and coppering. Work which has been tumbled or emery polished in cleanly manner may safely be placed directly in the combination solution. The density of the solution should be kept low and the cyanide content always sufficient to keep anodes from acquiring heavy black coating. Use solution as near boiling heat as possible and a voltage ranging from 5 volts to 12 volts may be employed. If you have occasion to treat soldered pieces in the combination solution usually used for iron or steel we would advise you to be very careful in regulating the temperature of the bath and the length of time these pieces remain in the solution under action of the current. A very brief period should elapse between the entrance to bath and the removal and the solution should not be hot enough to scald the hands of operator, a lukewarm solution and little longer time is safest plan.

* * *

Question.—Will you please inform me of the length of time a nickel solution will usually continue working satisfactorily without any refreshing or new anodes? We have one small tank which has been working seven months and the anodes are nearly all worn away and the solution is very pale green.

Answer.—A nickel plating solution will remain in good working condition only so long as the amount of metal released by the anodes approximately equals the amount of metal deposited at the cathode. If you have a 6 foot plating tank and the capacity of the tank is possibly several hundred gallons, and the total effective anode surface does not exceed 12½ square feet, the natural

result would be that the anodes would require renewing in much shorter time than would be the case if you had the maximum square foot surface area which the tank will accommodate—or say 31¼ square feet. The maintenance cost is less when large anode surface is employed, the resistance of the bath is less also. The installation cost is greater, but if nickel is to be deposited out, it must be in the solution, and the most economical source of supply is the anode. If you have 12½ square feet of anode surface and make a practice of plating 20 square feet of cathode surface in the bath the anodes will require renewal quite frequently and the nickel deposits obtained will not be as good as they would be if bath were equipped with larger anode surface. A properly equipped nickel plating bath should remain in good working condition, without attention other than occasional addition of metallic salt, for approximately 1 year, allowing 60 hours per week 52 weeks per year. If solutions strong in chlorides and maximum current densities are employed, a well equipped bath might become exhausted in less than six months, especially if the anodes were of low percentage quality. High percentage nickel anodes would resist the strong action better.

* * *

Question.—A few weeks ago I had some trouble with a cyanide copper plating solution, it plated slowly, did not cover well, color was not good. I was told to add copper. I then added 8 lbs. of copper salt dissolved in cyanide and then the copper deposits began to blister. The solution registered 10 degrees on a hydrometer and has caused me much trouble since. What shall I do to restore the solution to good working order? Should a cyanide copper solution require metallic salt additions occasionally and which is best to use, copper cyanide or copper carbonate? Our working is all flash coppering, no heavy plating.

Answer.—Remove some of the copper solution (from 1/3 to 1/2 the total quantity) to a barrel or other container and fill the plating tank again by adding water to the remaining solution, this should reduce the density to about 5 or 7 degrees Be. Try the solution at this density. Very frequently the real cause of blisters is over concentration of solution, although 10 degrees Be is not regarded as a danger limit if the current is regulated properly, but, for flash coppering you will find that a solution of low density will serve you more satisfactorily than one rich in metal. Keep the free cyanide only sufficient to maintain clean anodes during rest periods. Copper salts are not usually required frequently, but much depends on amount of work processed, area of effective anode surface as compared to cathode surface and the voltage used. Voltage should be at least 5 to 6 volts. Anode surface should be made regularly avoiding excess. Either copper carbonate or copper cyanide may be used; the superiority of copper cyanide is mainly due to its high metal content. Many very successful experienced platers continue to use the carbonate. In your case it would not alter your expense account greatly or interfere with your production if you test the salt which you have not been accustomed to using.

Question.—Recently when ordering sodium cyanide for use in our plating baths we asked the foreman plater if there was more than one grade, if so, which grade he would advise buying. He told us there were several grades, but that any grade other than the "fused" quality would meet our requirements equally well. The salesman with whom our order was placed did not agree with the foreman plater and to be safe we ordered the best grade. Now we would appreciate the opinion of your correspondent relative to the question.

Answer.—If your foreman plater had troubled himself sufficiently to become acquainted with the reactions which occur in a plating solution containing cyanide in appreciable quantities, he would understand that the strongest material obtainable should be used for increasing the cyanide content of a plating solution, since if a salt containing a relatively low percentage is used, a large amount of sodium compounds will be introduced into the bath unnecessarily.

The ordinary commercial cyanide may consist of the sodium salt alone or there may be traces of potassium in it. To aid you in future buying we will state a comparison which you will find valuable. The theoretical content of cyanogen (the property essential in plating practice) in pure potassium cyanide is approximately 39 per cent.; on account of the lower atomic weight of sodium pure sodium cyanide contains a little over 52 per cent. cyanogen. The various grades of sodium cyanide on the market contain varying amounts of cyanogen. As this is the active radical and the part that actually does the work in the plating solution, it does not make a great difference ordinarily whether the cyanogen is in combination with sodium or potassium, and the price of the salt is governed by the cyanogen content. The grade termed 98 per cent. cyanide is a potassium compound containing a considerable amount of sodium and about 40 per cent. of cyanogen; 130 per cent. cyanide is the sodium salt calculated to potassium. In other words, 100 pounds of sodium cyanide contains as much cyanogen as 130 pounds of potassium. In operating cyanide solutions it is important to keep the content of cyanide within certain limits. Too much cyanide may prevent deposition entirely and cause trouble generally, while too little cyanide allows the solution to become exhausted by reason of diminished anode action.

* * *

Question.—We are having considerable difficulty in obtaining a good lustre on our nickel plate, the deposit is very dense and quite grey in color. What would you suggest as a remedy? We want a soft deposit.

Answer.—Evidently you are employing too strong current or too high voltage, and thereby forcing the deposit. Nickel deposits obtained under such conditions are difficult to color even though the solution producing them may be in perfect balance. Try your current and if you note a marked improvement reduce the tension or volume as the test indicates and if necessary increase the duration of plating. The solution density for your class of work (as indicated by letterhead) should not exceed 10 or 12 degrees Be for single salt solution, or 5 to 5½ degrees Be for simple double salt solution. Boric acid, about 2 to 3 oz. per gallon of nickel solution, is often highly beneficial in cases such as yours. If satisfactory results are not obtained by either of the above methods, and the deposit is actually slower in forming, add about one pound of powdered ammonium chloride to each 50 gallons of the solution. Dissolve the chemicals before adding to the nickel solution. Use stronger current during first half of plating period than during later portion of run.

* * *

Question.—As a result of a dispute regarding upkeep of a zinc plating solution we are minus a plater and have a useless zinc solution on our hands. Please advise of the usual cause of zinc solutions failing to plate.

Answer.—With reference to zinc plating solutions generally, we would say that possibly the more frequent cause of failure to function is a weak or depleted condition of the solution. To test a case of this kind dissolve 2 oz. pulverized ammonium chloride and 2 pounds of zinc sulphate (crystallized) for each gallon of solution. Use a portion of the plating solution when dissolving the chemicals. If your work is irregular in shape or contains depressions of appreciable depth it is advisable to give constant attention to the metallic strength of the solution. Throwing into depressions is the one weak feature of zinc plating solutions as ordinarily operated. The addition suggested herein has repeatedly given splendid results when steel stampings of irregular shape were proving troublesome. Sometimes platers obtain best results by operating the solution at one-half the usual density with same voltage as used with the denser solution. The above refers to the sulphate zinc bath. The better method would be to install a cyanide zinc solution. It has greatly superior "throwing" powers. The cost of the outfit is greater than the sulphate solution but the results obtained on deeply depressed portions of work is generally very satisfactory. The cyanide solution is operated with from 3 to 5 volts when used cold and from 1½ to 3 volts when heated to 120 degrees or 150 degrees Fahr. A hot solution is preferable for several reasons; it permits of lower voltage, the depressions receive the deposit more rapidly and the deposit is formed in better condition. A cyanide zinc solution may consist of 1 pound sodium cyanide per gallon of water, saturated with zinc carbonate (plastic). If there is an excess of carbonate add 6 oz. of the cyanide solution to each gallon; this will leave the necessary free cyanide and insure good working conditions.

THE KIND OF TALK THAT COUNTS

At the 305th meeting of the Philadelphia Foundrymen's Association, which took place on the 9th of March, Senator Cartwright delivered an address which was the main feature of the evening.

Senator Cartwright, who is one of the most learned speakers of the age, talked on the following subject, a square deal between Capital and Labor. He takes the poison out of men's minds and brings together the man with a white collar and the toiler in overalls.

These are strenuous days, just the time to hear this wonderful talker.

The Constructing or Building up of a Gear Pattern

Building and Turning the Rim—Spacing Off For the Teeth Before Removing Rim From Lathe—Setting the Arms Together

By H. J. M'CASLIN.

IN THE last few issues of Canadian Foundryman we showed the laying out of gearing by means of curves which had to be figured out, also methods of doing approximately the same thing by means of the odontograph. In the last issue we showed different jigs for holding tooth blanks while shaping them. In this issue we publish a small article on the construction or building up of the pattern for a gear. In a later issue we hope to publish a small series of articles on making bevel, worm and helical gear patterns. The bevel gear is well understood by most workmen, while the worm is not so well known and the helical is almost unknown While all of these types of gearing are useful and in everyday use, it is common talk amongst machinists and many other classes of mechanics that a worm wheel can not be cast satisfactorily and that a helical gear cannot be cast at all. As a matter of fact first-class worm wheels and first-class double helical gears can be cast, but the patterns must be first class and the molder who is going to use them requires to have some ability. The drawback to pattern makers now-a-days is that like molders they are not learning all the rudiments of the trade as they used to do and at the present time there are very few pattern-makers who could lay out a helical gear.

Good workmen at any trade are not any too plenty and the man who takes enough interest in his trade to learn all the details will be the man who will be called upon to hold the good positions. Pattern making is nice work but to take a job which has been laid out by some one else and just do the work on it is not all there is to be a good pattern maker.—Editor.

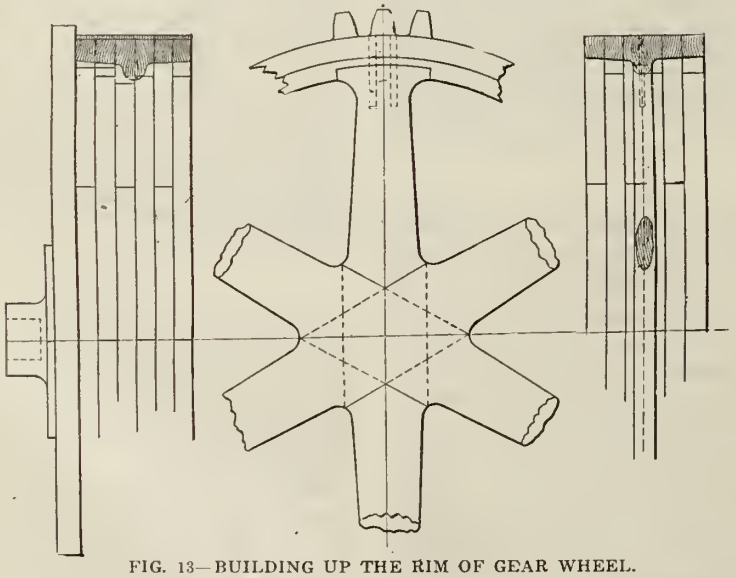


FIG. 13—BUILDING UP THE RIM OF GEAR WHEEL.

Construction of Gear Patterns

The general method of constructing or building up a gear wheel pattern is shown in Fig 13. The rim should be built up and turned in the usual manner with just perceptible draft in the outer diameter. The number of teeth should be spaced off before it is removed from the lathe. If there is a surface plate available the rim should be laid on it and, with the try square, lines drawn across the face corresponding to the spacing done in the lathe. Placing the try square against the rim of the gear is not always a reliable method.

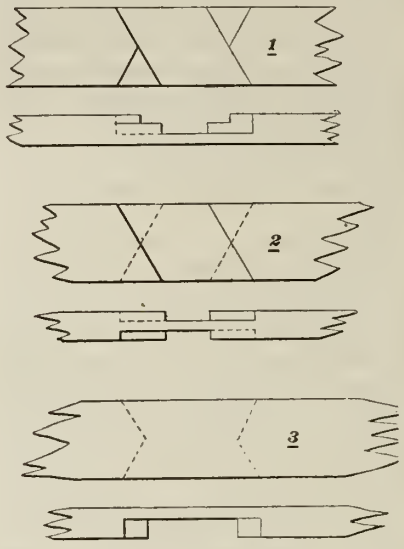


FIG. 14—SETTING THE ARMS TOGETHER.

Fig. 14. shows a substantial manner of setting the arms together. This work can be done very handily on the ordinary bench saw. After the arms have been put together, they should be let into the rim as shown in Fig. 13 and secured with glue and dowel pins. After the teeth have all been jigged out they should be placed on the rim, the root of each tooth being set with its edge in contact with one of the spacing lines drawn on the face of the rim. This is a very much more accurate method than attempting to space the teeth to a center line. Each tooth should be glued in place and rubbed down so that it fits the line accurately and then after the glue has set slightly, nailed in position. As the work proceeds the teeth should be tested with square and calipers and the work finished by rubbing in a leather fillet.

BEGINNING WITH MAY ISSUE.

With the May issue of Canadian Foundryman we will begin a series of articles by W. P. Essex, of London, Ont., which will be of exceptional interest to pattern-makers.

To appreciate the value of these articles one must know Mr. Essex. Mr. Essex is the mechanical superintendent of the Spramotor interests whose head offices are located at London, and who, in their different plants, manufacture spraying machinery, gas engines, and sundry other lines. His articles will not only treat on pattern making but will lead up to the metal patterns, fitted to follow boards, match plates, stripping plates, squeezers and right on through to the finished castings.

In his early teens Mr. Essex began his life's career in a little brass works where one molder was employed. The line of work done included plumbing, steam and gas fitting, bell wiring, general brass founding and finishing. The one practical foundryman, whom we have designated as the molder, included in his list of capabilities that of plumbing, steam and gas-fitting, bell wiring, foundry work and finishing, and Mr. Essex was employed as his assistant.

His next position was in a larger shop where his work consisted of pickling, milling and grinding castings, sorting scrap brass and finally learning the trade of brass finishing which apprenticeship, however, he completed in a larger and better shop.

While yet a boy he decided to try his fortune in the United States; first going to Detroit and then to Cleveland, where he followed the brass finishing for a while and then took up the trade of metal pattern and tool work. After two years in Uncle Sam's country a spell of sickness brought him home.

After regaining his health he, for the time being, abandoned the metal work and began an apprenticeship as a wood pattern-maker, but still clinging to the same line, viz: plumbers' and steamfitters' supplies.

He next spent four years in a stove foundry pattern shop. Then followed a period spent in several different Canadian cities on larger work such as marine engine, mining and saw mill machinery, steam pumps, etc.

The call of the North came and he soon found himself making patterns for the most northerly situated foundry in Canada; that of the Canadian Copper Co., now the International Nickel Co. at Copper Cliff in the great nickel district of Sudbury.

He returned to his home town after two years in the North and settled down to the study of foundry methods, and three years ago accepted the position which he now holds—that of mechanical superintendent of the different plants of the Spramotor Company.

While making wood patterns for heavy machinery is nice work and calls for a lot of careful study and mechanical ability it must be remembered that this class of pattern is usually given to a good, qualified workman in the foundry, while the more simple metal patterns, particularly those which are fitted to a machine are not always given to the most skilled foundrymen, so it will be seen that simplest kind of production patterns must be made with a high degree of care and accuracy, for the reason that the machine operator lacks the skill and experience of the practical man and that a second lost on a mold soon runs into hours and days of loss from the machine.

Mr. Essex's articles will cover these points and will be read with interest by foundrymen as well as pattern-makers.

Laying Out Cast (Not Cut) Diametrical Pitch Gears

A Valuable Table for Pattern Makers, Showing Cast Gear Teeth Dimensions Instead of the Regular Cut Gear Dimensions

By JOHN S. WATTS

THE following table accompanied by the necessary information compiled by Mr. Watts should be of exceptional interest to pattern makers, following as it does the articles by Mr. McCaslin on the subject of gearing. As will be noted, Mr. Watts points out that the standard cut gear tooth must be modified to allow for imperfections in cast gears.—Ed.

Cast Diametral Pitch Gears

The accompanying table, will greatly simplify the work of laying the teeth out for a pattern of a diametral pitch gear with cast (not cut) teeth. The teeth of a cast gear differ from those of a cut gear in having more clearance at the root and between the teeth, to allow for roughness of the casting and possible over-size.

The top line of the table gives the diametral pitch, and the second line the corresponding circular pitch, in inches. The third line gives the dimension "A", which is the addendum of the teeth, see Figure A. This dimension is the same as for cut teeth, and is equal to

$$\frac{1}{DP}$$

"B", is the dedendum, and is 3-64", more than it would be for a cut gear, to ensure that the teeth will clear at the root, even if the casting is slightly oval, as it will very likely be, in any but very small gears. The formulae used to determine the dimension "B", is

$$\frac{B = 1.157}{DP} + 3\text{-}64''$$

"C", is the thickness of the tooth on the pitch line, and is necessarily less than that of a cut gear of the same pitch, the formulae used in making up the table is,

$$\frac{C = 1.4785}{DP} - .02''$$

"R", is the radius at the base of the teeth and is equal to .3927

$$\frac{}{DP}$$

"D," see figure 1, is equal to the pitch diameter divided by sixty, and the radii, E and F, as given in the table, for the various pitches and number of teeth, will give the correct profile to the teeth. It will be noticed that for gears having over 36 teeth, a single radius is used, as no undercutting is necessary in the teeth of gears having more than that number of teeth. Gears having over 360 teeth, will be practically racks, and should be made with teeth having straight sides at 14 ½ degrees inclination, the other dimensions being as given in the table.

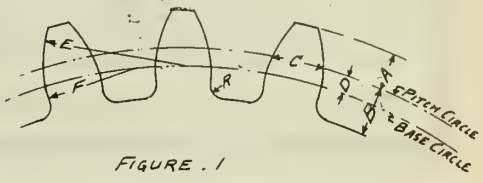


FIGURE . 1

Radii for pitches larger or smaller than those given in the table, can be found by proportion, as these radii are in direct proportion to the circular pitch, or what is the same thing, in inverse proportion to the diametrical pitch, that is the radii for a 10 DP gear will be half of those for a 5 DP gear.

When making patterns for a pair of gears, the pattern-maker must give the teeth a slight taper or draw, along the face of the gear, to facilitate withdrawing the pattern from the mould, and care should be taken to ensure that, in assembling the machine in which these gears are to be used, the thick end of the tooth in the gear, is in mesh with the thin end of the tooth in the pinion, and vice-versa, as otherwise the teeth will be carrying the whole load on one corner.

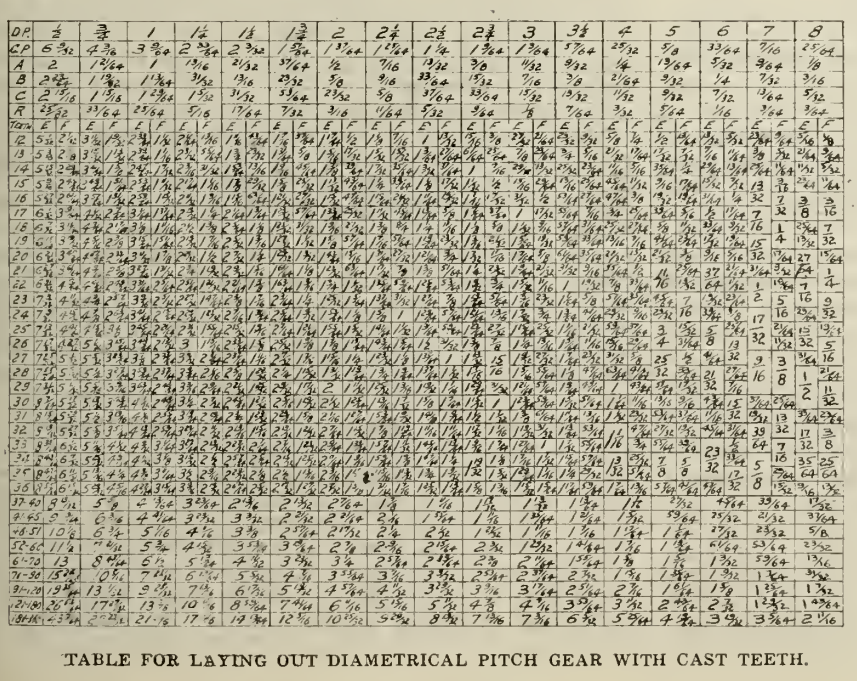


TABLE FOR LAYING OUT DIAMETRICAL PITCH GEAR WITH CAST TEETH.

PATTERN LUMBER

Editor Canadian Foundryman:

What is your opinion of whitewood as a pattern lumber? How does it compare with pine? Are there any other woods any better than pine?

Answer.—Whitewood is not at all suited for good patterns; it is in the same category as basswood. Whitewood is loose grained and would require an enormous lot of shellac to keep the moisture in the sand from soaking into it. It is also affected by changes in the weather, or in other words, whitewood has the serious objection of being too susceptible to atmospheric changes. It also seems to be always shrinking; in short, one of the earlier settlers in Ohio said that there was a great deal of whitewood timber in that country; he himself had cut a tree which squared up to 24 inches for 20 feet in length. This log he had sawed into planks and used for a floor in a 20 x 30 building. It took just fifteen planks to cover the floor; "but the plaguey stuff shrunk so fast that I had to put in one new plank each year, and in fifteen years I had an entire new

(Continued on page 39)

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Are Conditions Becoming Normal?

IN the last issue of Canadian Foundryman we predicted that in another month things should be pretty close to normal. We can not say that we were entirely correct, but at the same time we were not so far astray. War times and normal times must not be confused. Times will never be as they were during the war, but still they will have to be different from what they are now before they can be considered as normal.

In talking to different manufacturers we learn many different features of the situation which would hardly be credited, but which look reasonable enough after due thought.

One manufacturer put it thus: During the war and for some time after the signing of the armistice, sheet steel such as he used in his business was practically unprocurable, but he had to have it at all costs and from whatever source he could get it, so he communicated with all the houses where it was likely to be on sale. Almost invariably he would get a reply quoting a price but regretting that prompt delivery could not be promised. In his desperation he would write back, accepting the price as satisfactory and requested that his order be filled as promptly as possible. He would write such letters to every institution that seemed any way encouraging and the thought never occurred to him to cancel any of them and as a consequence the orders remained on the order books of the supply houses and when their turns came the goods were forwarded.

When a fellow gets caught like this he feels so cheap that he hates to tell anybody, but still he has a big stock of material which cost him war time prices and which he must put on the market with some advantage to himself. Everybody is clamoring for cheaper goods, so if he has to reduce the price he must take it out of the men. They (the men) do not want to stand a cut so the boss reluctantly finds it necessary to close down.

This has been found to be the shortest route to avoid labor trouble. If the man is laid off he cannot go on strike and of course has no strike allowance, so he is soon ready to go back to work, particularly if his wife has acted the part of advance agent and made the necessary arrangements. This kind of thing is going on to a considerable extent all along the line. Firms who could be busy are closing down until conditions get where they can run profitably. Every industry is dependent on others for success and each has to wait for the others to move before going very far, with the result that reorganizing and getting back to normal is a slow process, but it is coming sure if slow. In a short canvas of some of our industries we find some improvement and abundance of optimism. In an interview with James Hamilton, managing director of the Peter Hamilton Co., Limited, Peterborough, Ont., who do job work on a large scale, both in the machine shop and foundry, that gentleman stated that the foundry end of their business, employing about twenty men, which has been closed for a month, due to lack of orders, would reopen at once. Mr. Hamilton stated that the general slump under which business has been laboring for the past few months is due for a break and he, personally, is very optimistic about future conditions. He must have had business in view or he would not have expressed himself in this manner. In Galt, things are picking up to some extent, but not as rapidly as could be desired; machine tools in particular being exceptionally slow. Woodworking machinery is selling right along. The dullness in the machine tool business is probably accounted for from the fact that manufacturers are waiting until business picks up to such an extent as will overtax their present capacity. At Preston, with the exception of the stove and furnace business, the shops are working at normal. Stoves and furnaces could not help but be hard hit from a mild winter such as we have just passed through. Woodworking machinery is also moving satisfactorily in this industrial centre. The Preston Woodworking Machinery Co. have already shipped seventy-five machines to Great Britain and were boxing up three more for shipment. They had just shipped four of their electric ball-bearing sand riddles to Canadian foundries the previous week and were preparing another for shipment. The Preston Car & Coach Co., in addition to the regular car and coach work, are building three electric locomotives which call for a lot of cast iron work and the Stove Works, while none too busy on their own work, are making good on this. At Kitchener the foundry business looks encouraging. The tire business brings a lot of foundry work with it, but while the automobile plants are getting busy there are quite a number of tires to be disposed of before any rush orders can be expected in the foundry. The Blower & Forge Company are filling some large orders and are finding business much better than for some time past, but owing to having quite a bit of stock ahead the molders are taking a couple of days off each week, but it will only be for a short time now. At Hamilton, some of the shops which ran steady all winter are talking about slackening off for a while, while some are getting busier. The Westinghouse Electric Company are running their full complement of 2,600 men on full time and have lots of work. They are adding a large extension to their machine shop to accommodate the work which is to be done. At Guelph business is in a fairly satisfactory way. In fact the molders are beginning to shift about, which would indicate that things are not too bad. For instance, the White Sewing Machine Co. wanted some molders and some of the boys at the International Malleable Works, thinking that as things had been busy for a long time, a slack spell must be about due, decided to try the sewing machine shop. The International Malleable Works, however, replaced them with

other molders, which would not seem to indicate that any slack spell is due in that plant. On the whole, while things are not as rushing as we would like to see them, there is every indication that things are improving. Manufacturers who have full store houses want to empty them, but there are lots of store houses which are not full and business from now on will gradually improve from week to week.

How to Locate Canada

BEFORE the war Canada was not so well known as it is to-day and people in remote parts of the world might be pardoned for asking the question "Where is Canada?" Since the war everybody knows what Canada is if they do not know where it is.

For the benefit of those who are not properly posted we would say that there is no spot in the world so easy to locate as Canada for the reason that the compass always points to Canada. No matter where you may be located, in the Sahara desert or in the African jungle or anywhere on this terrestrial ball, if you want to find Canada just take out your compass and you will find it pointing this way. Canada makes no brag of possessing the North Pole, but it must be remembered that the compass does not point to the North Pole, but to the magnetic pole or polar magnet as it is sometimes called. This polar magnet is located in Northern Canada and while the true North Pole or nineteenth degree of latitude may or may not have been discovered, the polar magnet has been passed. This can be proved by the compass which turns backward and points away from the North after passing this spot. Northern Canada may have some drawbacks, but untold wealth is waiting there for the good of mankind. The magnetic needle situated thousands of miles away does not turn of its own accord and point to this particular spot unless there is something of more than ordinary importance to attract it.

This may be a pipe dream at this early date, but the day will undoubtedly come when valuable material will be taken from the spot to which the magnetic needle directs us.

Are We Going to Trade With Germany

ARE we going to trade with Germany? If so, upon what grounds and terms? The matter of German trade is coming up for discussion now in many places. Not long since the Canadian Association of British Manufacturers had a fairly pointed argument over the problem, some holding that members had no right to act as agents for what they termed enemy lines in Canada. Others in the association held it would not be fair to restrict members in this way, as it would simply toss business over to others.

And so it goes. Nor can it be said that Germany is standing back while Canadians are making up their minds. Every week seems to show an increase in the volume of German catalogues reaching this country. Nor are they the starved-looking publications one might expect to receive from a country that has gone through the experiences of the past few years.

Canadian Foundryman asked some of the leading manufacturers to give their views on the matter. Our letter drew attention to the amount of business Germany was already doing here, and to the oft-repeated claim that Germany must be allowed to trade with the world in order to pay off her debts.

Menace of Cheap Labor

B. H. Neill, sales manager of Canada Machinery Corporation, Galt, holds that the Canadian plant has a right to consideration and protection before the position of Germany is considered. He says:—

"It is our opinion that German goods should not come into the country unless at a heavy surtax sufficient to offset the difference in labor costs as well as the depreciation in German currency.

"If we have to trade with Germany in order to assist her to pay her war indemnity, and by so doing have our country flooded with cheap goods while our own factories and workmen remain idle, better forget the indemnity and put an embargo against goods from a discredited nation. It is not long since every good Canadian was solemnly declaring he would never again buy German goods. How quickly these declarations are forgotten when the dollar is involved!

"Our Customs Department is already assisting German exporters by appraising values on basis of exchange on day of entry. For instance, the other day the German mark was valued at 1 7-10 cents. What protection does this afford the Canadian manufacturer who is helping to pay our own war debts?

"We are directly opposed to your suggestion."

Short, But Very Pointed

Canada Foundries & Forgings, Ltd., Welland, do not mince words in stating the case as they see it. Simply this, in a letter from B. J. McCormick, general sales manager of the company:—

"Replying to your letter of March 8th on the subject of re-establishing German connections, we wish to say that we have no desire to either buy or sell any articles of commerce with these people."

Not Particularly Interested

The Mason Regulator & Engineering Co., Montreal, have not gone very fully into the matter, as it is one that does not concern them in their business relations. H. L. Peiler, general manager, writes as follows:—

"I am in receipt of your letter of the 8th instant, contents of which are noted, and with reference to which I may state that this company is not interested in products of German origin and I have, therefore, so far not been called upon to form an opinion in the matter.

"There appears to be no doubt that if we as individuals or collectively, should refuse definitely to trade with Germany, it would simply make it increasingly difficult for that country to meet her foreign obligations, and it would, therefore, appear to be a question of our general interests not to base trade relations upon prejudices aroused during the past conflict.

"However, as I have stated above, the question is one that does not directly affect this company's business."

Don't Penalize Canada

A. M. Kerr, secretary-treasurer of the Preston Woodworking Machinery Co., holds that Canadian manufacturers need some consideration, as well as Germany, and that there should be protection against cheap German goods. "Trading with Germany," says Mr. Kerr, "is a matter to which we have not given much attention since German competition does not concern us a great deal. We agree with what you say that if Germany is going to pay the huge war indemnity, we must be prepared to go ahead and trade with her as formerly, but Canadian manufacturers should have a chance, which they will not have if Germany, at the low price of the mark, can underbid her all along the line.

"If they are able to ship goods in here and prevent us from manufacturing them it looks to me as if it would be Canada that would pay her indemnity. We don't think that Canadian manufacturers should be penalized because the German mark is worth so little and selling so much below par that they are able to ship goods into Canada so easily in competition with Canadian industries. The value of her money eliminates competition almost altogether, and we would all suffer while she pays off her indemnity. Let our country put up a tariff barrier sufficiently large to make it a competitive proposition, and then I would say it would be more nearly as it should be."

Scraps from The Foundry Scrap Pile

W. T. Skidmore has just opened an iron and brass foundry at Pine street, Stratford, Ont., where he will do a general jobbing foundry business in both iron and brass castings.

* * *

W. R. Cuthbert and Co., 41 Duke street, Montreal, will begin at once, the construction of their new brass foundry to replace the one recently destroyed by fire, in which a loss of $35,000 was entailed.

* * *

The Toronto Furnace Company, Limited, Ont., has been incorporated to manufacture stoves, heaters and furnaces by Charles H. Bowyer, Henry G. Smith and others, with a capital stock of $200,000.

* * *

The Record Foundry & Machine Company, Moncton, N.B., was destroyed by fire on March 28. The damage to the shops and warehouses is estimated at $70,000, fully covered by insurance.

* * *

The National Casting Co., Belleville, Ont., will start at once on the construction of a new foundry building, in which they will install the latest types of equipment for turning out high grade grey-iron castings.

* * *

The Electric Furnace Construction Co., 98 Chestnut street, Philadelphia, announce that they have closed a contract for a large electric heat treating furnace with the Yale & Towne Mfg. Co., Stamford, Conn.

* * *

The A. W. Cash Company, Limited, Toronto, Ont., has been incorporated with a capital stock of $50,000 by James L. Ross, Arthur B. Mortimer, Arthur W. Holmested and others to manufacture iron, steel, metal forgings, castings, etc.

* * *

The Chatham Malleable and Steel Co. Chatham, Ont., is building an addition to its present plant which will make it practically double its present capacity. Equipment for the manufacture of automobile accessories will be installed.

* * *

The Siche Gas Range and Heat Co., Limited, has been incorporated at Toronto to manufacture heaters, ranges, stoves and hot water boilers by Frank J. Hughes, Leo J. Phelan, Daniel P. J. Kelley and others with a capital of $60,000.

* * *

The Pure Hoist Air Furnace Co., Limited, has recently been incorporated at Ottawa with a capital stock of $40,000 to manufacture furnaces and other heating apparatus, by Maurice M. O'Connell, James S. Wilson and others.

* * *

The H. Mueller Mfg. Co., Sarnia, Ont., manufacturers of plumbers and steamfitters brass goods, who are adding other lines of brass goods to their list, are now contemplating the erection of a grey-iron foundry in addition to their brass plant.

* * *

The Downer Pattern Works, formerly located at 1 and 2 Jarvis St., Toronto, but which was badly damaged by fire last January, has been moved to 265 King St. West, in the building formerly occupied by the Hobbs Hardware Co.

* * *

The Brant Foundries, Limited, Toronto, Ont., has been incorporated by John Jennings, 169 Lowther Avenue, Arthur R. Clute, 67 Yonge street, and others with a capital stock of $40,000 to build and operate foundries, steel plants and to manufacture iron and steel castings and metal forgings.

* * *

Installs Electric Furnace. A Greaves-Etchells Electric Furnace has recently been started up at the Electric Steel Products Co., Turners Falls, Mass. The furnace will be used for the manufacture of special castings. Equipment was installed and supplied by the Electric Furnace Construction Co., Philadelphia.

* * *

G. and J. Weir (Canada) Limited Ville La Salle, P.Q., are building a new foundry which they hope to have in operation in the early summer. This addition to their plant will add from 150 to 200 men to their pay roll. This company manufactures the Weir pump and have a large establishment in Glasgow, Scotland, and have for many years been importing these pumps in a partly finished condition to be assembled at their Canadian plant. The building of the foundry will enable the whole of the work to be done here, including the supply of spare parts.

* * *

T. H. Watson and Co., Ltd., Sheffield, England, and the Electric Furnace Construction Co., Philadelphia, announce that arrangements have been made with the General Combustion Co. of Canada, Limited, New Birks Building, Montreal, to handle, build and sell their various electric smelting, melting and refining furnaces in Canada. The Canadian rights of the "Greaves-Etchells" type of furnace, which has been widely adopted in the United States, England, France, Spain, Sweden, and other foreign countries, are also included in the arrangements made.

The American Company will also co-operate with the Canadian Company on the supply and installation of the various types of electrically heated core and mold drying ovens, annealing and heat treating furnaces, and on electric furnace problems in general.

Catalogues

Mahr Manufacturing Company, Minneapolis, Minnesota, U.S.A., manufacturers of foundry burners of different classes are distributing some interesting literature on their lines of oil burners, which include compressed air type of foundry torches for lighting the cupola, skin drying molds, drying ladles etc. The illustrations show the portable tank for holding the compressed air, the ordinary type of nozzle which is said to produce incomplete combustion, and the Mahr double chamber nozzle, which is said to give complete combustion. The ladle drying devices are also shown in detail and are quite interesting and simple.

* * *

The Elk Fire Brick Company of Canada, Ltd., Sun Life Building, Hamilton, have issued a bulletin describing their products. This company manufacture refractory brick in all shapes, for furnace linings, blast furnaces, cupolas, fire brick arches, checker brick, etc. The catalogue illustrates every different shape, and gives information on the sizes available, and the guarantees given, also the deviations from specifications allowed. The shapes shown have been adopted by the Refractories Manufacturers' Association as standard. In addition to the foregoing there are a number of tables showing numbers of bricks required of various shapes to make certain size linings. Other useful tables are fusion points of different materials, and comparison of the different thermometer scales, circumference and areas of circles, and weights of various materials.

* * *

P. Pryibil Machine Co. Incorporated, 512–524 West 41st Street, New York City, have recently published two profusely illustrated catalogues No. 18 and No. 19. No. 18 treats on their ball bearing metal spinning lathes and accessories for round and oval work, also ball bearing, polishing and buffing lathes. The machines are described in detail, and samples of the work done in them are illustrated and include practically everything in the way of cooking utensils, dining-room services, cigar holders and in fact about everything in the way of spun and polished goods in silver, bronze and alumin-

um. No. 19 describes and illustrates their line of woodworking machinery, which includes everything which could be of use in a wood-working establishment. All the machines are fully explained. Many valuable tables are included in both catalogues.

* * *

Moline Molding Machines are fully described and illustrated in a neat catalogue which is being circulated by the Moline Iron Works, successors to H. W. Cooper Saddlery Hardware Mfg. Co., Moline, Illinois. The contents consist of three types of hand operated squeezers. No. 1, stationary machine, especially adapted for use in malleable and grey iron, brass, steel or aluminum foundries where two or more heats are run per day and the floors are comparatively small. No. 2 portable machine, designed to use in foundries requiring a portable machine to run to the side of the sand pile. Width inside of wheels 26 inches, the head and table are adjustable as to height. No. 3 portable machine, designed to use in foundries requiring portable machines to run over the sand pile. Width inside to inside of wheels 58 inches. Height of table above floor 30 inches. All the machines will handle flasks 12 in by 24 in. or under, and are very simple in construction. All working parts are above the table; consequently sand cannot get into mechanism. Numerous testimonials from satisfied users are also given.

* * *

Blaw Knox Company, 617 Farmers' Bank Bldg., Pittsburgh, Pa., are issuing a profusely illustrated circular, describing and illustrating their "Blaw" foundry grab bucket. The main features of the bucket are: it is an automatic grab bucket operating completely from the hook of any crane or hoist—requiring no changes in the lines nor hoisting machinery; unusually low head room, admirably adapted to the mixing and cutting of molder's sand and to the rehanding of coal, sand and coke. Can be operated by a single hoisting drum, hooked on or off the crane as its services are required. It is of sturdy construction. It is built so that all shocks are absorbed by the working mechanism of the bucket. Its working parts are few and amply protected against wearing and abrasive action. They are made to serve any height of crane. Other products of the company mentioned are steel form for concrete construction, fabricated steel specialties, water-cooled appliances for high temperature furnaces, pressed riveted and welded plate work, standardized sectional steel buildings.

The Globe Pneumatic Engineering Co., Ltd., Victoria St., London, S.W., England, distributed a profusely illustrated catalogue of 80 pages treating of the different tools manufactured by the company. Among the tools shown those of most interest to the foundryman are: Pneumatic chipping hammers, portable drilling and grinding machines, pneumatic foundry rammers, pneumatic sand riddler and separator, rectangular type with ball bearings, pneumatic riddler to use ordinary 18-inch foundry riddle, straight lift simple pressure type cylinder hoists, both vertical pendant and horizontal bracketed, blackwash sprayer, air tank and air motors and air compressors. In addition to these, many tools, useful in the machine shop, boiler shop and smith shop are shown. The interior mechanism of the various tools is shown in detail. A line of electrically-driven tools is also shown. Charts and tables along with complete descriptive matter make the book a valuable addition to the foundry library.

* * *

Alfred Herbert Limited, Coventry, England, with offices and show-rooms at Nos. 1-3 Jarvis street, Toronto, are distributing an interesting catalogue on molding machines and foundry equipment, manufactured by the Britannia Foundry Co., Coventry. The contents show the Wardle's patent jar-ram molding machine; turn-over jar-ram molding machine. Plain jar-ram molding and core-making machine, Baby jar-ram core-making machine. These are all pneumatic driven machines. In addition to these is the "Coventry" Patent molding machine which is described as a power machine without power. The patent mechanical geared head enables a man, without undue exertion, to ram any mould as hard as it is required. The "Britannia" molding press is a hand operated squeezer machine. The "Adjustable" molding machine is a hand operated stripping plate machine. "The Coventry" Pattern plate apparatus is a machine of simple design for the rapid production of match plates which can not be misfits. Space is also given to the Alfred Herbert patent "Duplex" sand mixer which is of the centrifugal type and a most complete machine, also single and multi-cylinder air compressors, especially adapted to the jar-ram molding machine. All the machines are described in an exhaustive manner and this along with numerous tables makes the book a valuable acquisition to the foundry library.

PATTERN LUMBER

(Continued from page 35)

floor." This of course is exaggerated, but it forces home the fact that white-wood is faulty. White pine is probably the best all-around material for patterns, as it is light, easily worked, takes glue and varnish nicely, and is fairly durable. Mahogany and cherry have good points but are expensive and harder to work, although more durable.

One Of Canada's Numerous New Foundries

Built in the Most Up-to-Date Fashion From the Most Approved Material and Equipped With Everything of the Best is the New Plant in Brockville, Ont.

By our own Representative

OUR representative had the pleasure, recently, of calling on Machinery and Foundries, Limited, of Brockville, who have just completed the erection of a foundry and machine shop. Both buildings are of most modern fire-proof construction, being built of reinforced concrete, including the roof on which is an asbestos roof covering. Steel sash were used throughout. The foundry building is of monitor construction and measures 160 x 60; the monitor ventilators being operated by controls. The machine shop building included in which is pattern shop, stock and shipping departments, measures 275 x 55.

The welfare of the employees has been considered in the erection of a special building adjoining to be used as a lavatory in-

NEW PLANT OF MACHINERY AND FOUNDRIES, BROCKVILLE, ONT. NOTE THE HEIGHT OF FOUNDRY COMPARED WITH THE MACHINE SHOP.

cluding shower baths. Both buildings are steam heated. They purpose specializing in the production of grey iron and brass castings of high quality for machining purposes, and are especially equipped for turning out large quantities of small and medium size, capacity of foundry being 10 to 15 tons per day.

They are placing on the market a full line of cistern and deep well pumps, including the well known double acting or "Red Wing" force pumps for which there is a large domestic and export demand, also cast iron hardware of all descriptions, hollowware, grinders, etc.

The personnel of the company are J. Gill Gardner, president; C. M. Rudel, vice-president; W. McLeod Gardner, man. dir.; George E. Purkis, secy.-treas.; Hon. Geo. P. Graham, director; L. J. Belnap, director. The president, managing director, and secretary-treasurer are experienced foundry men having been connected with the Jas. Smart Mfg. Co. for many years and their practical knowledge coupled with an efficient factory organization should guarantee high quality goods at a minimum of cost.

Shipping facilities are of the best, being served by a Grand Trunk spur line, which was recently laid down to serve the city's industrial area.

WOODEN WATER MAIN OVER A CENTURY OLD

While we like to stick up for cast iron at every opportunity we are forced to the conclusion that if it were not for the coal tar with which cast iron water pipe is coated inside and outside, a hundred years of service would make them look badly used up, while wooden pipes are nearly as good as new after a century in the ground. Here is a good one.

When New York, the great Metropolis of the Western world, could boast of a population of but 50,000 people, and was then as now the largest city on the American continent, the first water company was formed by an act of the legislature at the behest of Aaron Burr, whom history knows so well. Its object was to supply the city with a pure and sufficient supply of water, which records show it did not do. However, as that is a story of a political nature it needs no repeating here.

In 1798 Burr placed himself at the head of a private company and after much difficulty succeeded in securing a charter, and soon after commenced the construction of a storage reservoir on Chambers street, near Center street. The water supply was secured from a large well 25 feet in diameter, located at the corner of what is now Reade and Center streets, the water being pumped into the storage basin directly from the well. From the reservoir the water was distributed through hollow logs of white pine which were bored through the center to a diameter of from two to six inches, with curious wooden gates, valves and connections of various kinds. The system was known as Aaron Burr's pipe line, and only enough was done to provide the city with water to maintain the company charter. Twenty-three miles of water pipe were laid by Burr and his colleagues of the Manhattan Company, and records show that most of this pipe was of the wood type referred to above.

Aaron Burr's pipe line was laid in 1798, and while New York grew and prospered the company died, but a more adequate water supply was secured and the Manhattan Company's wooden pipe line was relegated to the past and forgotten. The start of the present system was made in 1835.

For over 100 years the old white pine pipe has remained in the ground, but with the march of time and necessary excavations for various projects, contractors have unearthed sections of the wood pipe in almost perfect state of preservation. Invariably people who stopped to gaze at these relics of long ago have been greatly impressed by their condition. To be sure, the pipe was crude in construction and in shape and general arrangement it did not compare favorably with the wooden water pipe of the present day. So impressed at the fine state of preservation of these old pipes were many leading New York engineers that when a section of the Burr pipe line was discovered about 1910, by workmen in the subway excavations around Williams street, it was placed on exhibition at the Engineer's Club where it continues to attract the attention of visitors and also stands as a monument to the durability of wooden water pipe, and a memory of the days of Burr and Alexander Hamilton, over a century ago.

There are many other reports of wooden water pipe which tend to point to its durability. Recently while putting in a high pressure main, workmen who dug up one of Boston's streets found a 50 foot section of a wooden pipe which had been installed in 1789 and used continuously until 1840 for bringing water from Jamaica Pond in Roxbury to the city of Boston. The wood is said to be pitch pine, and while the outside surface shows signs of decay, the wood is still hard and apparently as good as ever. This pipe section was of similar construction as that excavated in the New York subway job.

HINTS OF VALUE

Shortly after a fire in a certain plant in England the following hints were given: Don't store oily cotton waste in a warm place at all, and don't store it where firing will cause danger anywhere. Under favorable conditions oily waste, as well as some other things, will oxidize rapidly, and in the presence of air will ignite through the heat engendered; and this should be thoroughly knocked into the heads of people handling the stuff in workshops, as it is quite easy to have a fire from some "unknown cause," or of which the "origin unknown" report is given by the fire brigade. Of course, as a waste product, greasy waste has some small value, but it is better to burn the stuff right away than to have a fire during a busy time. These hints, in a way, seem unnecessary, yet, strange to state, we still forget these simple precautions.

The Universal Tires, Ltd., has been incorporated with head office at Montreal, and capital stock of $50,000, to carry on the business of dealers in automobile tires and accessories and to manufacture, buy, sell, repair and deal in automobile tires, etc.

BURNING FUEL OIL

Set the burners open wide,
Do not touch the valves at side;
Keep the pressure on the pump,
And up the bally steam will jump;
If the smoke is black and thick,
Open up the fans a bit;
If the smoke is thick and white,
To slow the fans will be quite right;
For when sufficient air is given,
No smoke ascendeth up to heaven.
If the jets refuse to squirt,
Assume the cause is due to dirt.
Should the flame be short and white,
You have combustion clear and bright;
But should the flame be yellow and long,
Combustion is entirely wrong.
A wise man to his heater sees,
And keeps it 200 degrees;
To have it more is not quite wise,
Because the oil may carbonize;
A little lower has been found
To give as good results all round.
If the filters are kept clean,
No rise in pressure will be seen;
But should the pump kick up a ruction,
There's likely air within the suction.
The pressure governs the supply,
So do not keep it very high.
If these instructions you will follow,
You'll beat the other fellow hollow.

Extract from "Marine Engineering Knowledge," W. C. MacGibbon.

RESISTANCE OF BODY

Measurements have been made during the past few months by the American Bureau of Standards of the electric resistance of the human body, the measurements being made in such a way as not to include the resistance through the skin where currents entered and left the body. By eliminating the large and uncertain resistances through the skin, results were secured which are said to be more consistent than any previously obtained. These show that the resistance of the same part of the body of different individuals may differ by a ratio of three to two or even more, the resistance of a person changing from day to day and often by small amounts in an hour. The resistance also depends to some extent upon the position of the body and the extent to which the muscles are relaxed.

CORRECTIONS

In the last issue of Canadian Foundryman we described and illustrated a grab bucket manufactured by Edgar E. Brosius of Pittsburgh, and the printer made it read gear bucket, although no gears were visible. We also reviewed a book on Foundry Molding machines and patterns by Edwin S. Carman, N.E. and the printer started Mr. Carman's name with an E making it read Earman. Both of these mistakes we blamed onto the carelessness of the printer, but he in turn blamed them onto the bad penmanship of the editor so we dropped it at that, although regretting the errors which we admit should not have occurred.

Our CEYLON FACINGS, manufactured from direct imported CEYLON PLUMBAGO, have so established their superiority over other so-called Plumbago Facings that no wide-awake Foundryman can afford to overlook them.

When you buy from us you get foundry supplies of unexcelled quality—and you pay *no duty*.

We have at all times large stocks ready for immediate shipment—no holding up by customs or lack of shipping facilities.

FACINGS

No. 206 Ceylon Plumbago

This is a splendid general purpose lead. May be used wet and makes a perfect wash for dry sand molds.

XXX Ceylon

Pure Ceylon Plumbago for use on the heaviest green sand castings. This facing gives a bright colored casting with a perfectly clean surface.

Hamilton Facings will not run before the iron, burn, or brush off the mold. Quality, service, uniformity and dependability are combined in every barrel—and every barrel carries with it our guarantee.

Gambite

GAMBITE is superior to any liquid core binder on the market. It is made from the best quality Canadian spruce and contains 52 per cent. of soluble solids; is free from gas and can be used alone or in combination with oil, flour, rosin, or any dry compound.

The Hamilton Facing Mill Co., Limited

Head Office and Mills

Hamilton, Ontario, Canada

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$26.00
Lake Superior charcoal, Chicago	40.50
Standard low phosphorous, Phila.	31.50
Basic, Valley furnace	26.00
Bessemer, Pittsburgh	28.96
Canadian foundry pig	38.00

NEW METALS

	Mont.	Tor.
Lake copper	$18.00	$17.50
Electro copper	17.50	17.50
Castings copper	17.50	18.00
Tin	36.00	39.00
Zinc	7.50	7.50
Lead	6.50	6.50
Antimony	8.00	8.25
Aluminum	31.00	30.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$ 9.50	$ 9.00
Copper, crucible	11.00	11.00
Copper, heavy	11.00	11.00
Copper, wire	11.00	11.00
No. 1 mach. comp.	10.00	9.75
New brass cuttings	7.00	8.00
Red brass cuttings	8.00	8.00
Yellow brass cuttings	6.00	6.00
Light brass	5.00	5.00
Medium brass	6.00	6.00
Scrap zinc	4.00	4.00
Heavy lead	4.00	4.00
Tea lead	2.00	2.00
Aluminum	10.00	10.00
	Per gross ton	
Heavy melting steel	$12.00	$14.00
Boiler plate	11.00	12.00
Axles (wrought iron)	25.00	20.00
Rails	12.00	14.00
Malleable scrap	20.00	20.00
No. 1 mach. cast iron	30.00	25.00
Pipe, wrought	8.50	8.00
Car wheels	30.00	25.00
Steel axles	20.00	18.00
Machine shop turnings	6.00	6.00
Stove plate	23.00	20.00
Cast borings	5.00	5.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¾
Acid, nitric	.10
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.18
Copper, carbonate, anhy.	.35
Copper, sulphate	.10
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.16
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite, per cwt.	6.50
Sodium phosphate	.15
Tin Chloride	.80
Zinc Chloride C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.50
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.08¾
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09½
Crocus composition	.12
Emery composition	.10
Rouge, silver	.64
Rouge, powder, nickel	.38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$30.00	$34.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	32.00	38.00
Copper sheet, tinned, 14x 60, 14-oz.	38.00	42.00
Copper sheet, planished, 16 oz. base	44.00	48.00
Braziers', in sheets, 6x4 base	36.00	41.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$ 9.50	$14.50
Sheets, 3½ lbs. sq. ft.	9.25	14.00
Sheets, 4 to 6 lbs. sq. ft.	9.00	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 6.50	$ 6.50
Sheets, black, No. 10	5.50	5.50
Can. plates, dull, 53 sheets	12.00	13.00
Can. plates, all bright	14.00	14.00
Queen's Head, 28 B.W.G.	10.75	10.75
Fleur-de-Lis, 28 B.W.G.	10.00	10.00
Zinc sheets	13.00	15.00

Pittsburgh Markets

PITTSBURGH, April 7.—The iron and steel situation is now clearly defined. Any doubt there may have been as to the nearby future of the trade is resolved, as there has been buying in the past few weeks and the character of the buying is well established. When there was a complete absence of demand there was naturally doubt as to what would be the character of the demand when any developed.

Practically the universal experience of the steel producers is that of doing a carload business. That is true of the Steel Corporation quite largely when it receives releases on orders previously held up, though the Corporation does receive some releases of larger volume, and it is the usual experience of the independents when receiving new orders. It is only occasionally that a good sized order is placed, this being for some piece of construction work. The regular manufacturing consumers, as well as the jobbers, are calling for material in carload lots. In many cases the specifications show that the material called for is required to piece out on stocks already in hand. Some jobbers and manufacturing consumers have gotten to the point where they need to take steel in general, but in most cases it is a matter of rounding out stocks, which have been getting ragged.

There is nothing that can be called a "spring demand" and that is distinctly disappointing. There was no occasion for disappointment in January, when predictions made in December that there would be a revival in demand after the turn of the year failed of verification, for such predictions had not been well founded. January is not a month in which steel demand normally increases. March is such a month. The rate of steel consumption at the beginning of April does not appear to be larger than the rate at the beginning of January, and probably it is less. It is true that some industries are more active, much stress being laid upon this fact in various reports, but on the other hand many industries are less active, and not much is said about that.

Steel Prices

There is no deadlock on steel prices. Buyers give no intimation that there is any price at which they would really take hold. If there were any large demand to be developed by reducing prices the United States Steel Corporation would undoubtedly make the reduction it is certain to make eventually. The majority of the Steel Corporation's customers seem to be well satisfied with the Corporation's policy of holding to the Industrial Board schedule, and they could hold this view for no other reason than from having stocks of raw or manufactured material they wish to liquidate on the best terms possible. Of course those who are in the market to make fresh purchases secure the lowest quotations obtainable, but their buying is of small volume. While the total quantity of material now being specified is small, the probability is that the bull

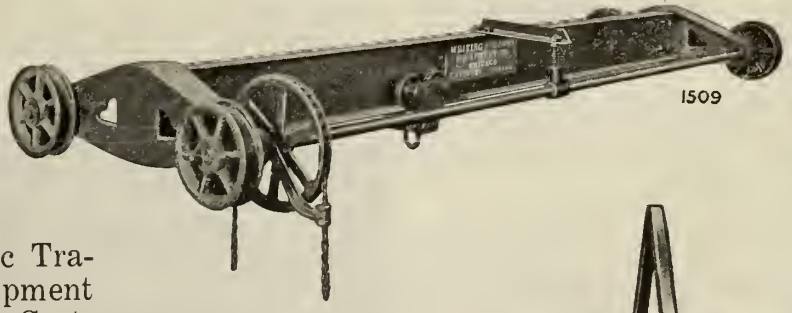
FACINGS

and

FOUNDRY EQUIPMENT

Labor-Saving, Cost Cutting Foundry Supplies for Every Requirement

WHETHER it be facings or other foundry supplies, you will do well to call on us. We have **Everything for the Foundry** and handle the lines of old established manufacturers acknowledged to be the best. Furthermore, we are in a position to give immediate attention to all orders. These **Quality** and **Service** facts are recognized by a long list of customers—join this list and you'll get complete satisfaction.



WE handle the famous Whiting line, which includes Core Ovens and Accessories, Cranes, Electric Travellers and Hoists, and all equipment for making Brass, Steel or Iron Castings. Also Hytempite Cement, Molding Sands, etc. Complete estimate and layouts supplied on application. Write us for prices and particulars.

The

Dominion Foundry Supply Co., Limited

"Everything for the Foundry"

MONTREAL **TORONTO** **WINNIPEG**

CLASSIFIED ADVERTISEMENTS

TWO CENTS A WORD. Minimum charge is $1.00 for 50 words or less. Ads. set in border are at the card display rates.

FOR SALE

FOR SALE—ONE OIL BRASS MELTING FURnace with self-contained motor, 110 volts, S.P. 60 cycles, Hawley down draft pattern; capacity four hundred pounds; in first-class order. First cheque $500. Apply to the McClure Optical & Manufacturing Reg'd., 109 St. John St., Quebec. P.Q. (c4f)

ONE NO. 2 M. EUREKA ROCK CRUSHER. size 8" x 12" with 11 H.P. gasoline engine, and folding elevator, all complete and mounted on steel chassis with wheels. This outfit is built especially for road building and road repairing, where frequent changes are required. Also adapted to all kinds of contract work. Practically new. Bargain price. Address Black Donald Graphite Co., Ltd., Calabogie, Ont. (crf)

PUT YOUR MATERIAL ON A SHANTZ TRUCK while moving through the shop. It will pay you. Factory trucks of all kinds and special sizes and styles to order promptly. Jobbing castings. P. E. Shantz, Preston.

FOR SALE—AUTOMATIC ROTATING TABLES, most durable constructed table made. Write, mentioning "Canadian Foundryman," for particulars to Mussens Limited, Montreal (crf)

FOR SALE—SHOVELS, BRASS AND GALVANized Riddles, Bellows, Core Ovens, etc. Write for particulars to Box 3021, Canadian Foundryman. (cmf)

FOR SALE—GRAND ROTARY SAND RIDDLE. Absolutely new. Box 1021, Canadian Foundryman. (cmf)

TUMBLING, TILTING AND BURNISHING barrels for sale. Made in Canada. Box 2021, Canadian Foundryman. (cmf)

SAND RIDDLES—YOU CANNOT AFFORD TO be without this sand riddle. Ready for immediate shipment. Operated by electricity. This is a real bargain. Write for particulars to Box 4321, Canadian Foundryman. (cmf)

CLIMAX GREY CORE COMPOUND SAVES dollars' worth of labor. Climax Core Wash remains in suspension, will not wash, buckle or rub off, and it cleans easily. A trial will convince you. Write for samples and prices to Hamilton Facing Mill Co., Hamilton, Ont. (crf)

IF YOU HAVE IRONWORKING OR WOODworking machines for sale, call or write Canada's largest dealers in new and used machinery. Write, mentioning Canadian Foundryman, to H. W. Petrie Ltd., Toronto. (cff)

USED AND NEW WOODWORKING MACHINery, also metal lathes and small tools, belting and transmission. Write, mentioning Canadian Foundryman, to General Machinery Co., 67-69 Frederick St., Toronto. Main 2200. tf.

Canadian Pattern & Castings Co. Ltd.
49 Drouillard Road
FORD CITY, ONTARIO
Wood and Metal Production
PATTERNS
Brass, Bronze and Aluminum
CASTINGS
In Production Quantities

SITUATIONS VACANT

WANTED—FOUNDRY FOREMAN IN GRAY iron foundry. Box 26421. (c4f)

SITUATIONS WANTED

A PRACTICAL, EXPERIENCED FOUNDRY foreman of 25 years' experience on heavy and light gray iron and semi-steel. Specialist on machine tools and general machinery. Well up in cupola practice and green and dry sand molding. Recommendations on request. Apply to Box 8421, Canadian Foundryman. (cmf)

WANTED—A PATTERNMAKER FOR BRASS furniture trimmings; light work; must have one or two years' experience. Write to Box 9421, Canadian Foundryman, Toronto, Ont. (cmf)

PATTERNS

LET US SOLVE YOUR PATTERN PROBLEMS. Wood and metal models and aluminum plate work. Write, mentioning Canadian Foundryman, to the Hamilton Pattern Works, 120 Adelaide St. W., Toronto. (crf)

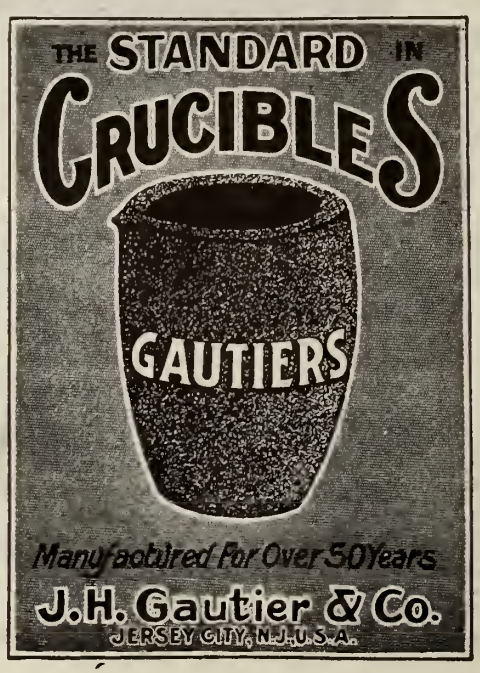
WOOD AND METAL PATTERNS—OUR WORK is good and prices right. Give us a try. Write for particulars, mentioning "Canadian Foundryman," to Downer Pattern Works, 1-3 Jarvis St., Toronto.

MACHINERY WANTED

WANTED FOR CASH—WOODWORKING MAchinery of every description. Box 4121, Canadian Foundryman. (cff)

ELECTRIC MOTORS WANTED FOR CASH — Fisher Electric Co., new warehouse, 77 Front Street East, Toronto, Ont., Main 3288. (cmf)

Bailey & Bell Fire Brick Co.
Manufacturers and Importers of High Grade Fire Brick, Fire Clay and General Supplies. Special Shapes, Cupola Block, Stoker Brick, Boiler Tiles, Stove and Quebec Heater Linings.
MADE IN CANADA
1347-49-51 Dufferin St., Toronto. Phone Ken. 4335



of it is in the form of specifications against old contracts or releases for shipment against orders previously held up. In the case of the Steel Corporation this business is, of course, at the regular Corporation or Industrial Board prices, while in the case of the independents there are probably adjustments to the existing independent market as commonly quoted.

Bars remain quotable at 2c for carload lots with desirable specifications, shapes and plates being correspondingly 2.10c. These prices were possible a month ago, but concessions obtainable on large lots are probably smaller now than then. Seeing that it is two months since the independent market broke, and there has been no actual decline in these three important commodities for a month, it is plain that the break is over. The independent market is more or less stabilized, and the next important development will probably be the Steel Corporation's reduction, which may occur very soon or not for several months. While it is always somewhat dangerous to prophesy, there is reason for making this prediction. With their very light operation the independents have high costs, much higher than they would have with the same wage rates and raw material costs. They could reduce their production costs by having a larger operation, and that would be an incentive to cut prices further, but if much more business were to be obtained by making prices the Steel Corporation would be influenced by the condition as well, and would reduce its prices. Hence it seems reasonable to conclude that the independents are unlikely to reduce their prices much if at all until the time comes for the Steel Corporation to make its reduction. The common view is that when the Corporation acts on prices it will endeavor to make one reduction that will cover the whole ground.

The sheet market is lower by about $2 a ton on black and $4 on galvanized at 3.75c for black and 4.80c for galvanized. These prices can be done on carload lots if the specifications are attractive. On large lots the concession from the carload price are less than when the carload market was higher and it is not altogether certain that any concessions could be secured, except on the heavy gauges of galvanized, the difference in production cost between heavy gauge and 28 gauge being greater than the gauge differentials in the standard list.

A large portion of the plant of the Record Foundry and Machine Co., at Moncton, N.B., was destroyed by fire last week; the damaged section is that of the warehouse and machine shop. Considerable stock was carried in the warehouse at the time of the fire. The loss was fully covered by insurance. Reconstruction work will be commenced immediately.

Holland Core Oil Company

Holland Products Will Cut Your Costs!

CORE OIL

Holland Core Oils will reduce your number of spoiled castings to a negligible quantity. Made in five grades—**Big Stick, Regular, Old Regular, Special No. 1,** and **Extra Fast Drying.** These grades efficiently handle every phase of core making for grey iron, malleable, steel, aluminum and brass.

CORE FLOUR

Hi-Binder Core Flour makes thoroughly dependable cores, and yet it is not expensive. It is the only satisfactory, low-priced substitute for flour.

PARTING

Holland Straight Tripoli Parting is of the most modern type and is of uniform dependability.

These, and the other Holland Products—Match Oil, Kleen Core Wash, Hi-Binder Green Core Sand Facing for Steel —are made for the express purpose of reducing your costs. Give them a trial.

Canadian Agents:

The Dominion Foundry Supply Co., Limited

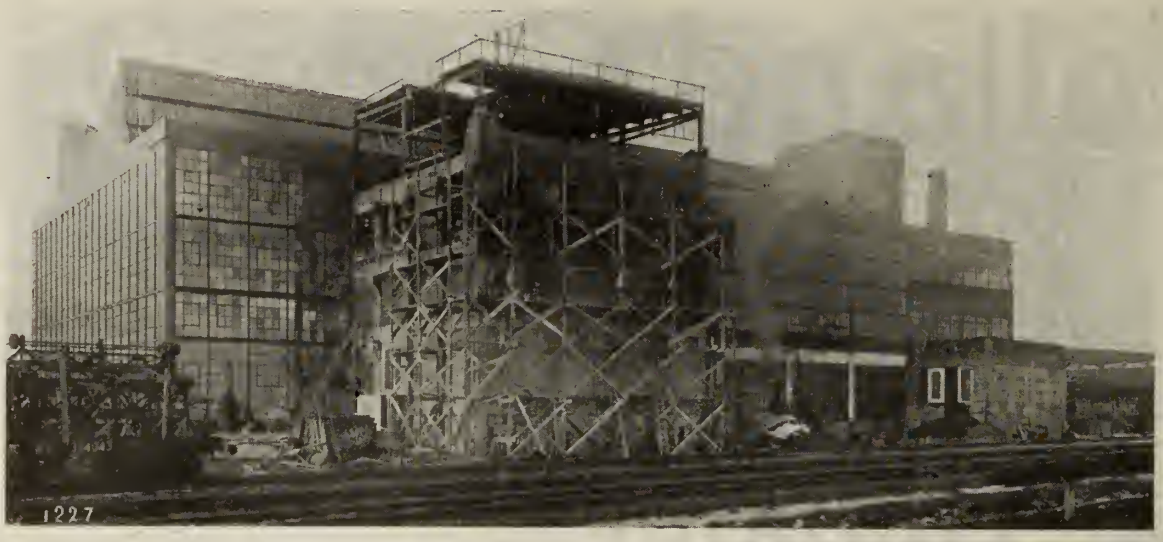
"Everything for the Foundry"

TORONTO MONTREAL

4600 WEST HURON ST.

HOLLAND PRODUCTS GOOD PRODUCTS ONLY

CHICAGO — — ILLINOIS



Foundry of Grinnell Co. of Canada, Ltd., designed by The H. M. Lane Company

Another Foundry That Is The Result of Careful Planning

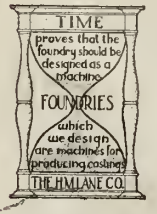
Benjamin Franklin, one of the greatest figures of colonial times, laid down something like a dozen rules to guide him through life.

All of us follow more or less rules—some of our own making—to influence our conduct and efforts, but knowledge and experience add or eliminate those which are best and those which are not best for any given purpose.

In that one field which we are wholly concerned with—foundry engineering—the rules we have adopted and evolved as the result of a lifetime of effort ensure the most efficient foundry design and layout possible, not alone because of their intrinsic value, but also because we know from broad and varied experience how and when to apply them.

The Foundry World, our monthly for keeping those interested in foundry practice informed of our work, will be gladly sent you upon receiving intimation of your wishes to that effect. There is no charge.

Should you be contemplating a new foundry or addition in the near future, we would suggest that now is a good time to have us prepare the preliminary data and plans.


TIME
proves that the foundry should be designed as a machine
FOUNDRIES
which we design are machines for producing castings
THE H.M.LANE CO.

THE H. M. LANE COMPANY

Industrial Engineers and Foundry Specialists

OWEN BUILDING, DETROIT, MICH.

Canadian Office: The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.

50 Nicholls Machines

Installed at the Toronto & Warren Plants

Grinell Co. of Canada, Limited

10-32 Type D with open end frame and adjustable steel side rails for different length and width of pattern plates.

The fastest and best built molding machine for making this class of work.

For further particulars about these machines and confirmation of regular daily production made on them, write for catalog 10C.

Wm. H. Nicholls Company, Inc.

6 College Place, Brooklyn, N.Y.

SLY SAND BLAST EQUIPMENT "UP - TO - DATE"

Modern Installation showing Pneumatic Elevating and Separating System.

Down Draft Ventilation

is acknowledged to be an essential feature from the standpoint of Hygiene and Efficiency. Less than one-third of the dust in the upper part of the room is drawn down quickly, instead of two-thirds or more being drawn up past the operator's face, as is the case in many inefficient and unsanitary outfits.

Pneumatic Elevating and Separating of Sand and Dust

Only *one Motor* required (at the fan)—no Screw Conveyor—no Bucket Elevator—no Screen Riddles—no mechanical parts to wear and to get out of order.

Simplicity and *Perfect Separation* are the outstanding features.

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Main Office and Works:
Cleveland, Ohio

New York
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The SLY Line of up-to-date Foundry Equipment

Steel Tumbling Mills
Iron Cinder Mills
Brass Cinder Mills
Resin Mills
Sand Blast Mills
Sand Blast Mills—Tilted
Exhaust Fans
Sand Blast Rooms and Blast Cabinet
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers

TABOR
3-inch Plain Jarring Machine For Small Molds And Medium Sized Cores

3" Tabor Jarring Machine with 12" x 14" Table

A Necessity in Every Foundry

SEND FOR BULLETIN M-J-P

THE TABOR MFG. COMPANY

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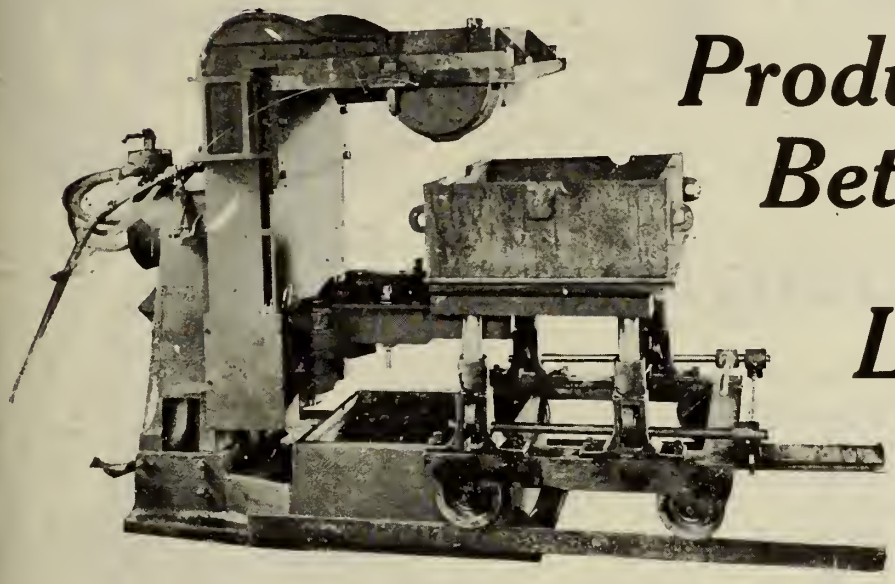
GRIMES
JAR-RAMMED ROLL-OVER MACHINE



Produce Better Castings for Less Money

Simplicity of Design
Ease of Operation
Low Cost of Installation

No Pits to Clean
Small Floor Space Required
Entirely Above Floor Level

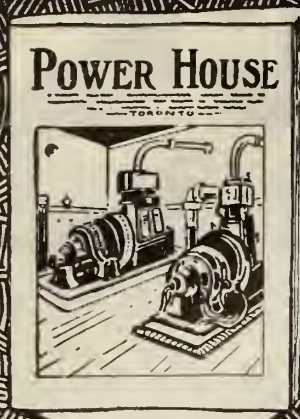
These features assist in making Grimes Molding Machines the best on the market.

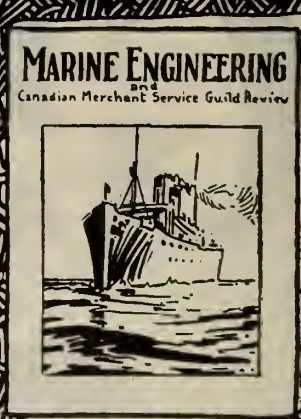
Grimes are made in many different types in both hand and power models up to 5,000 lbs. capacity, for use on a wide variety of work.

Grimes Molding Machines have solved many a hard molding problem. Let them solve yours. Write us to-day.

GRIMES MOLDING MACHINE CO.

5738 Hastings St. **DETROIT, Mich.**





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These four dominant factors of Canadian industry —Power House, Canadian Machinery, Canadian Foundryman, and Marine Engineering—are all members of the Audit Bureau of Circulations and of the Canadian National Newspapers and Periodicals Association.

These memberships entail obligations which are a protection to both subscriber and advertiser. The first requires perfect frankness with regard to circulation. The second, that the subscribers' and advertisers' interests shall receive first consideration. MacLean Publications give their clientele absolute protection as well as service of a high order.

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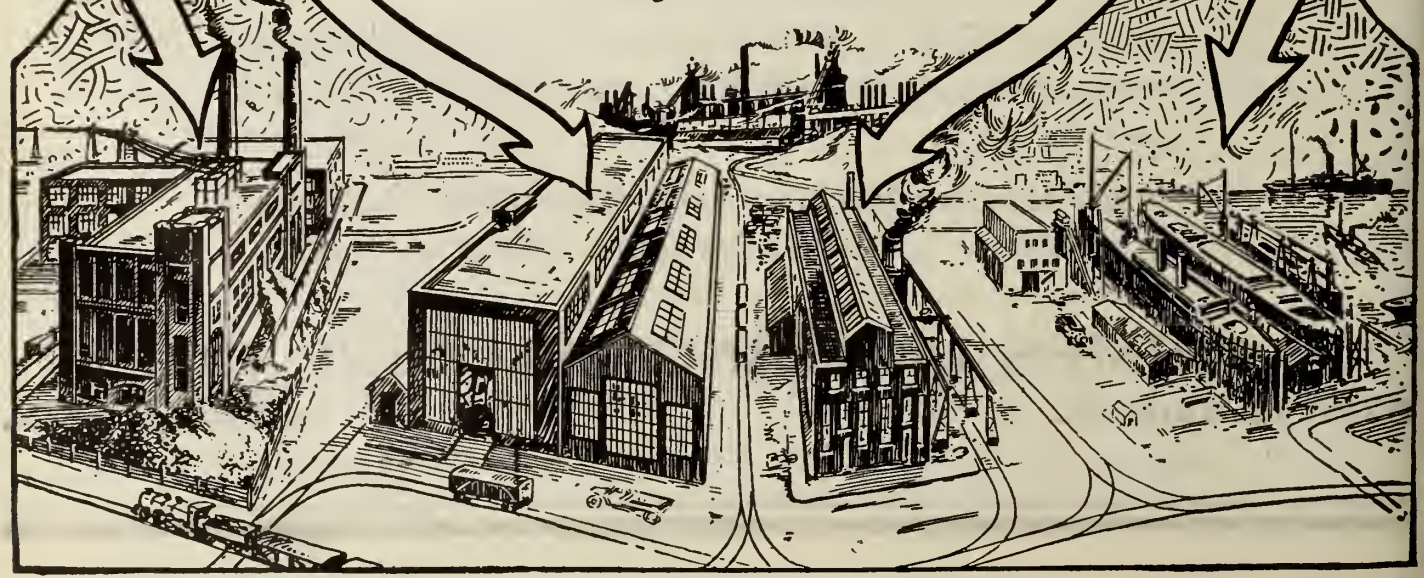
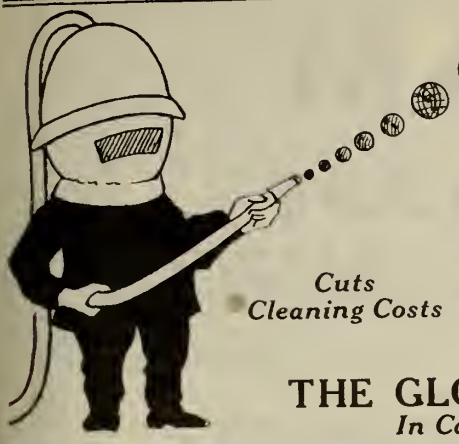




Cuts Cleaning Costs

The Effective Enduring Abrasive

It's the impact in blasting that does the work. **Sand** under impact crushes quickly and pulverizes to dust. It must be replaced by **new** sand frequently. Globe Chilled Shot can be used 250 to 275 times before it becomes ineffective. It reduces storage bins; eliminates sand driers; reduces labor costs.

Send for samples.

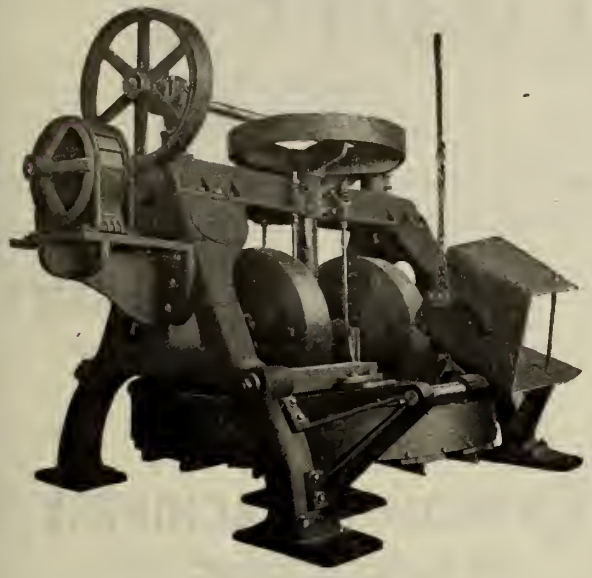
GLOBE CHILLED SHOT

It gives you a better and quicker Blasting Job at a reduced cost.

THE GLOBE STEEL COMPANY, Mansfield, Ohio, U.S.A.
In Canada: Canadian Johns-Mansfield Company, Asbestos, P.Q.

Frost

Wet Pan Sand Mill
for Steel Foundries



The *Frost* Mfg. Co.
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FOUNDRY PRODUCTION

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Industrial Plants
Power Plants
Foundries
Machine Shops
Bridges
Hospitals
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Public Buildings

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Reports
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Adequate foundry facilities, ample floor space, proper ventilation and lighting are features in foundry design, which, in connection with operating efficiency, will insure maximum production.

It will pay you to consult us on your foundry problems.

The Osborn Engineering Co.
CIVIL, MECHANICAL, ARCHITECTURAL ENGINEERS
2848 PROSPECT AVE. CLEVELAND, O.

Speed and Ease Accomplished on a Heavy, Rigid
FORD-SMITH GRINDER

Heavy Type Grinders

Our new line of floor grinders has been designed to put these machines on a really efficient basis. All types are of the strongest and most rigid construction. Even the highly skilled mechanic will find a great difference in the quality of work and the ease and speed with which it is done!

Full specifications, prices and photographs will be mailed upon request.

The Ford-Smith Machine Co., Limited
HAMILTON, CANADA

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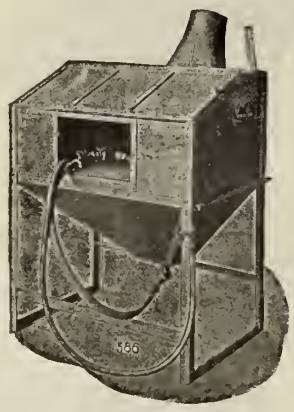
DOELCAM

SAND BLAST CLEANING CABINETS



These cabinets are practically the lowest in first cost than any other type of sand blast installation because they are complete in themselves, ready for operation by attaching to the compressed air line and exhaust system. Althougn the blast from the nozzle is not as great as the positive pressure, yet they give very efficient results on soft metal and are used a great deal for cleaning the scale from heat-treated parts. THEY ARE MADE IN A NUMBER OF DIFFERENT SIZES.

MUSSENS LIMITED

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IF you are in the market for Compressors, Grinding Machines, Motors, Cranes, or Hoist Scales, Trucks, etc., it will pay you to write for a copy of CANADIAN MACHINERY AND MANUFACTURING NEWS.

In addition to a Buyers' Directory of leading manufacturers of, and dealers in, New Machinery you will find lists of Used Equipment of almost every conceivable kind. And if you cannot find listed what you require drop us a line and we will locate it for you. This service is free to readers of CANADIAN FOUNDRYMEN. Just fill out the form herewith.

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Recovering Valuable Shot Iron

Doing Good Work for the Moffat Stove Co. Weston, Ontario

The Dings Magnetic Separator is seen here recovering valuable shot iron which would otherwise go to waste. The Moffat Stove Co. grind all the drop from the cupola in a cinder mill with open staves. The material that is small enough to pass through the staves goes to the Dings Magnetic Separator where the shot and other metal is completely recovered. Siftings from the foundry is also put through the Dings. This Company express themselves as well pleased with the work of the machine and regard it as a splendid paying investment. You can use a Dings in your foundry to paying advantage too. It will soon pay for itself.

Dings Magnetic Separator Company

Head Office and Works:

800 Smith Street DINGS Milwaukee, Wis.

Branches:—New York, 52 Vanderbilt Ave.; Denver, 1718 California Ave.; Detroit, 805 Hammond Building; Richmond, 1907 Main St.

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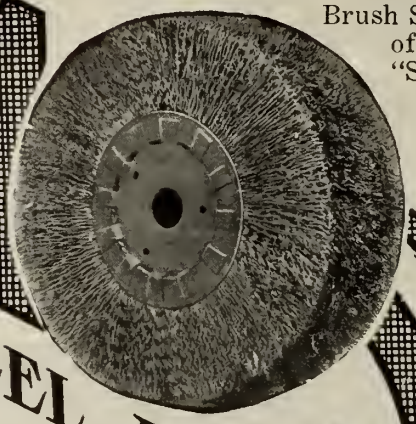
Economical for Cleaning and Removing Scale

The ready adjustability of "Samson" Brush Sections to any desired width of face is the big reason for "Samson" popularity. "Samson" Scratch Wheels remove scales and clean forgings, castings, and tools in record time.



Each Section a Brush in Itself

"Samson" Wire Wheel Brush Sections are made with metal disc centre, punched to fit any size of spindle. Each section is a complete brush in itself and can be quickly mounted on a shaft or spindle. No Hub or Holder is required. A trial order will convince you "Samson" scratch wheels are the most efficient and economical on the market.

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By choosing only those publications whose circulation is accurately measured, you not only practise economy in your advertising, but are assured that your money is buying a definite quantity of circulation.

The Canadian Foundryman's circulation is measured by the Audit Bureau of Circulations. Advertising placed in its columns is an economical investment.

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FOR GOOD

CORE OIL

The Best—and Why

We have concentrated many years of experience in making one grade of core oil. Naturally we have aimed to produce the BEST! That we have succeeded is borne out by the satisfaction it always gives. Highest grade for 20 years. Write for prices.

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FOUNDRY SUPPLIES
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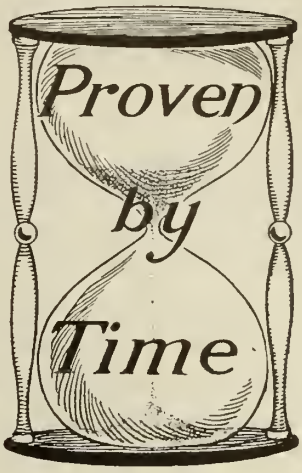
DON'T EXPERIMENT—BUY OUR SAND. Years of successful application to their various uses have proven they are unexcelled in quality and uniformity. We have all grades—Strong Silica, Sharp Silica, Lumberton, Albany, White Washed Silica, Fire Sand, Blast Sand, and Genuine Millville Gravel.

Also

PLUMBAGO FOUNDRY FACINGS.



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Send your orders and inquiries to our

Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

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Most reliable material for lining and patching Cupolas, Furnaces, Ladles, etc., saves time, labor and firebrick.

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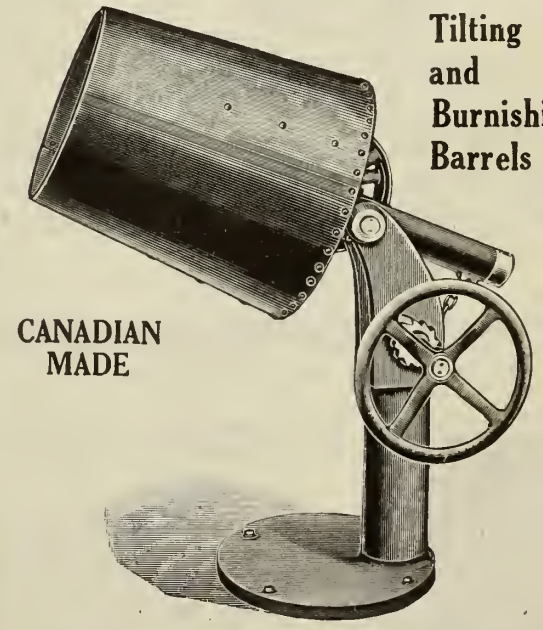

Tilting and Burnishing Barrels

CANADIAN MADE

SLATER & BARNARD

LIMITED

Hamilton, Ontario

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We acknowledge here the courtesy of the following Canadian customers, who have written us their appreciation of the services rendered them by the Mechanical Hot Blast Heater:

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Bowmanville, Ontario.
Hugh Park Foundry Co., Ltd.,
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Miller Bros. & Sons, Ltd.,
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The Metal Shingle & Siding Co., Ltd.,
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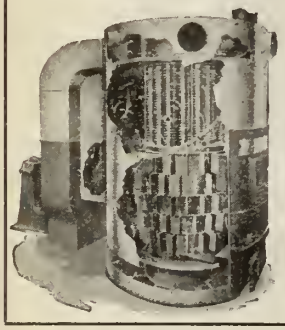
We sincerely trust the E. J. Woodison Co., Ltd., will enjoy a continuance of your patronage and confidence.

ROBERT GORDON, INC.
628 W. Monroe St., Chicago, U.S.A.



The Mechanical Hot Blast Heater
"More Heat --- Less Coal"

The Mechanical Hot Blast Heater propels its heat horizontally along the floor level to every distant corner. Heats the entire building uniformly —maximum variation of but 5 degrees determined by test. Ventilates—clears the air of fumes. Saves up to 50% on fuel. Burns hard or soft coal, coke, oil or gas.

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From graphite mine to finished crucible, the entire process is in the hands of Dixon operatives, many of whom have made the manufacture of Dixon Crucibles their life-work.

Each crucible that bears the name DIXON carries the endorsement of an organization which has been through every stage of crucible evolution.

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Joseph Dixon Crucible Co.
Jersey City, N. J.
U.S.A.
Established 1827

Canadian Agent:
Canadian Asbestos Co.
60 Front St. West
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Buffalo Brand VENT WAX

Easiest and Best Way to Vent Any Core

Buy It in Canada at

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E. B. Fleury, 1609 Queen St. W., Toronto.
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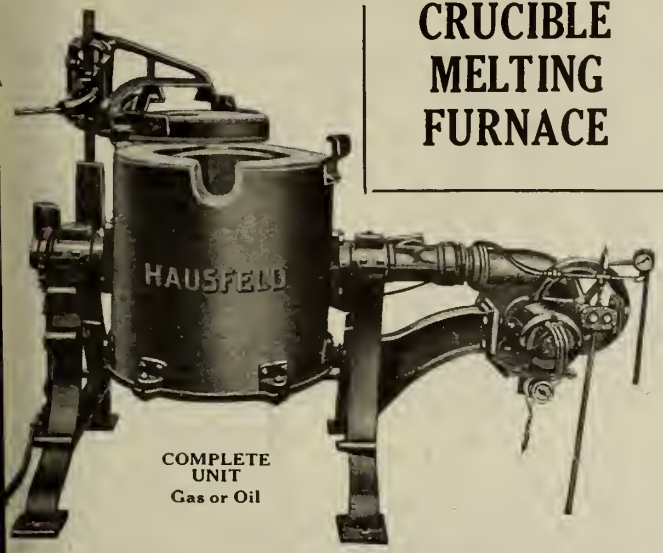
Give it a trial

HAUSFELD

CRUCIBLE MELTING FURNACE



Hausfeld Furnaces have been tested by time. Correctly designed to meet that severest of tests, the lowering of costs and the boosting of production, they have proven their value through years of service.

May we send you full information?

The Campbell-Hausfeld Co.
General Offices and Works: Harrison, Ohio

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MASTER FLASK

Diamond Master Flasks are light in weight, easy to handle, accurate and very durable. Their convenience and accuracy result in a larger and better production. Let your next order stipulate Diamond Master Flasks.

Sold in Canada by

Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

DIAMOND CLAMP & FLASK CO.
40 N. 14th St. RICHMOND, INDIANA

Mr. Foundryman

Save from 30% to 75% on your foundry equipment. This is possible if you buy direct from the manufacturer—thereby eliminating the middleman's exorbitant profit.

DAMP BROS.

Manufacturing & Welding Co.

852 Dupont Street, Toronto

Will furnish cheerfully on request carefully arranged prices on the following articles for your foundry:

Ladle Bowls
Ladle Shanks
Steel Bands
Steel Slip-over Jackets
Steel Core Plates
Wooden Snap Flasks
Tote Box
Tote Barrels, etc.

Partial List Price

Ladles Capacity		Shanks
50 lb.	$ 2.08	$ 3.18
100 lb.	2.93	10.72
150 lb.	3.38	11.70
200 lb.	4.55	12.68
400 lb.	8.45	15.60
600 lb.	17.88	18.20
800 lb.	22.10	20.15

(Liberal discount on our List Prices).

WRITE US FOR DISCOUNTS ON LIST PRICES.

Give us a trial to prove we can save you money on foundry requirements.

DAMP BROS.

Manufacturing & Welding Co.

852 Dupont Street
TORONTO

'Phone Hillcrest 3769

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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
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Woodison, E. J. C., Toronto, Ont.

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Mussens, Ltd., Montreal, Que.

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AIR HOIST
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Stevens, Frederic B., Detroit, Mich.

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W. W. Wells, Toronto.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Mussens, Ltd., Montreal, Que.
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Holland Core Oil Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich
Woodison, E. J. Co., Toronto, Ont.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Holden Co., Ltd., The, Montreal.

BOILER COMPOUND
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BOILER GRAPHITE
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BOILERS, STEAM
Ministry of Munitions, London, England.

BOOTS
C. H. Watt, Amherst, N.S.
Ministry of Munitions, London, England.

BORING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

BOTTOM PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

BRAKE SHOES, WHEEL TRUEING
Can. Hart Wheels, Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRASS GOODS, VALVES, ETC.
Crane, Ltd., Montreal.

BRICKS, RUBBING
Can. Hart Wheels, Ltd., Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, FOUNDRY AND CORE
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Manufacturers' Brush Co., Cleveland, O.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.

BUFFS AND BUFFING AND POLISHING COMPOSITIONS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.

BURNERS, CORE OVEN
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Can Hanck-Burner, Port Hope, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

CALKING HAMMERS
Holden Co., Ltd., The, Montreal.

CARBON BLACKING
Pettinos, George F., Philadelphia, Pa.
Woodison, Co., E. J., Toronto.,
Stevens, Frederic B., Detroit, Mich.

CARS, CORE OVEN AND FOUNDRY
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canadian Pattern & Die Castings Co., Ford City, Ont.

CHAIN BLOCKS
Mussens, Ltd., Montreal, Que.

CHAPLETS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS—SEE METALLURGISTS CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.

CHIPPING HAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CHISEL BLANKS
Holden Co., Ltd., The, Montreal.

CLAMPS, FLASK
Diamond Clamp & Flask Co.
Frederic B. Stevens, Detroit, Michigan.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

CORE BARROWS
Sterling Wheelbarrow Co., Milwaukee.

CORE BINDERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

CORE BREAKERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CORE COMPOUNDS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Mich.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton. Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Blystone Mfg. Co., Cambridge Springs, Pa.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip Co., Akron, O.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Scarfe & Co., Ltd., Brantford, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE SAND MIXER
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip Co., Akron, O.

CORE SAND MIXERS AND SAND MIXING AND COMPOUND MILLS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Hamilton.
Joseph Dixon Crucible Co., Jersey City, N.J.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto Ont.

CORE REDUCERS
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE TAPERING AND CUTTING-OFF CORE TESTING MACHINE
Wadsworth Core Machine & Equip. Co., Akron, O.
National Engineering Co., Chicago, Ill.

CORE WAX
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CUTTERS, CORE
Wadsworth Core Machine & Equip. Co., Akron, O.

CRANES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Mussens, Ltd., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES
J. H. Gautier Co., Jersey City, U.S.A.
Frederic B. Stevens, Detroit, Mich.
Woodison Co., E. J., Toronto, Ont.

CUPOLAS
Bailey & Bell Fire Brick Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Dominion Foundry Supply Co., Ltd Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Dominion Foundry Supply Co., Ltd Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM
Can. Hanson & Van Winkle Co., Toronto Ont.
Frederic B. Stevens, Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Dominion Foundry Supply Co., Ltd Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City N.J.
Gautier, J. H., & Co., Jersey City., N
Woodison, E. J., Co., Toronto, Ont

DOWEL PINS
Diamond Camp and Flask Co.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRAWBAR CENTERING DEVICE
Holden Co., Ltd., The, Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago Ill.

DRINKING FOUNTAINS
Crane Ltd., Montreal.

DRYERS, SAND
Pangborn Corporation, Hagerstown, M

DRYING OVENS FOR CORES
Dominion Foundry Supply Co., Ltd Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Monarch Engineering Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Skinner Bros. Mfg. Co., St. Louis,
Pangborn Corporaton, Hagerstown,
Sly, W. W., Mfg. Co., The, Cleveland,
Woodison, E. J., Co., Toronto, Ont.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown,

DUST EXHAUSTER, ANISTER SYST
Pangborn Corporation, Hagerstown,

DYNAMOS
Can. Hanson & Van Winkle Co., Toron Ont.
Frederic B. Stevens, Detroit, Mich.
Dominion Foundry Supply Co, Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

ELECTRIC DRILLS
Holden Co., Ltd., The, Montreal.

ELECTRIC FURNACES
Electric Furnace Construction Co.

ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids Mich.

ELECTRIC TOOLS
Holden Co., Ltd., The, Montreal.

ELECTRIC STEEL FURNACES
Electric Furnace Construction Philadelphia, Pa.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toron Ont.
Dominion Foundry Supply Co, Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toron Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

ENAMELWARE
Crane Ltd., Montreal.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids Mich.

Oliver

No. 166 HAND-PLANER and JOINTER

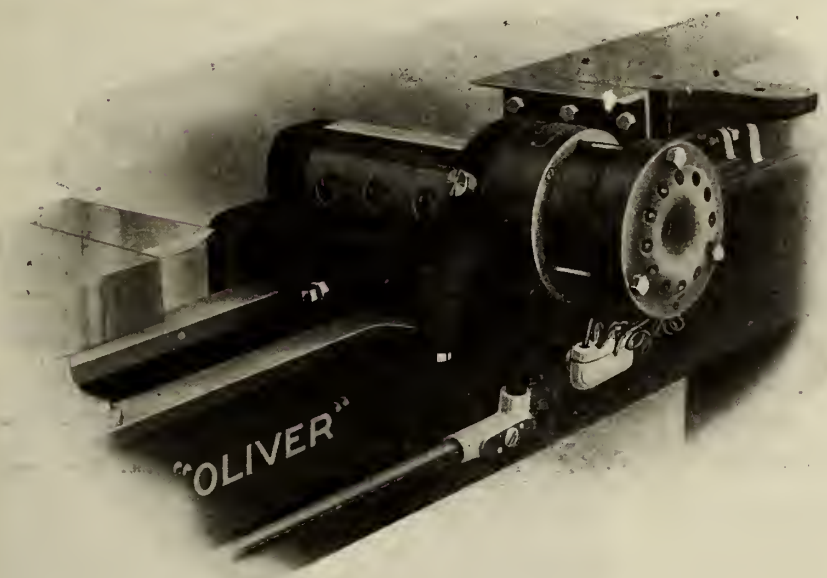

FIG. 2—CLOSE UP VIEW OF MOTOR AND CUTTER

This new machine is of rigid construction—and in every way the most up-to-date machine of its type.

Made in 6 sizes—widths of 9, 12, 16, 20, 24 and 30 inch.

The three-knife cylinder revolves on self-aligning ball bearings, and is direct driven at 3600 r.p.m. by a 3-phase induction motor operating on 220 volts. The stator of this motor is bolted directly to the frame of the machine.

The utility and simplicity of this machine is apparent from illustrations. Let us send you the remaining details.

FIG. 1—GENERAL VIEW OF THE MACHINE

Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, OIL, GAS AND STEAM
Holden Co., Ltd., The, Montreal.

ENGINEERS, CONSULTING
H. M. Lane Co., Ltd., Detroit, Mich.

ENGINEERS (FOUNDRY)
H. M. Lane Co., The
Osborn Engineering Co., Cleveland, O.

EQUIPMENT, CORE ROOM
Wadsworth Core Machine & Equip. Co., Akron, O.

FACINGS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Mich.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J. & Co., Toronto, Ont.

FACING SAND MIXER
National Engineering Co., Chicago, Ill.

FACING SAND MIXERS AND SAND MIXING AND COMPOUNDING MILLS
Wadsworth Core Machine & Equip. Co., Akron, O.

FANS, EXHAUST
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

FILLERS (METALLIC)
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Frederic B. Stevens, Detroit, Mich.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J. Co., Toronto, Ont.

FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

FIRE BRICK AND CLAY
Bailey & Bell Fire Brick Co., Toronto, Ont.
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Frederic B. Stevens, Detroit, Mich.
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FIRE CEMENT
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

FIRE SAND
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Frederic B. Stevene, Detroit, Mich.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FITTINGS
Crane Ltd., Montreal.

FLASK FITTINGS
Diamond Clamp & Flask Co.

FLASK PINS
Sterling Wheelbarrow Co., Milwaukee.

FLASKS, SNAP, ETC.
Diamond Clamp & Flask Co.
Hamilton Facing Mill Co., Hamilton, Ont.
Mussens, Ltd., Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Sterling Wheelbarrow Co., Milwaukee.
Tabor Mfg. Co., Philadelphia, Pa.

FLEXIBLE JOINTS
Holden Co., Ltd., The, Montreal.

FOUNDRY COKE
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY EQUIPMENT
Diamond Clamp and Flask Co.
Frederic B. Stevens, Detroit, Mich.
Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY FACINGS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY GRAVEL
Frederic B. Stevens, Detroit, Mich.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY MIXERS
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros Co.., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY PRACTICE
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY RIDDLES
Blystone Mfg. Co., Cambridge Springs, Pa.

FOUNDRY SUPPLIES
Sterling Wheelbarrow Co., Milwaukee.
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Mich.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

FURNACE LINING
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Penn.
Woodison, E. J. Co., Toronto, Ont.

FURNACES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Penn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FURNACES, BRASS
Campbell-Hausfeld Co., Harrison, Ohio.

FURNACES, ELECTRIC
Electric Furnace Construction Co.

GLOVES
ASBESTOS, DUCK AND LEATHER
Frederic B. Stevens, Detroit, Mich.

GOGGLES
Kling Optical Co., Cleveland, O.

GRAND ROTARY SAND RIDDLE

GRAPHITE GREASE
Beyer Machine Co., Jackson, Mich.
Pettinos, George F., Philadelphia, Pa.

GRAPHITE PRODUCTS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

GRINDERS, CORE
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
Wadsworth Core Machine & Equip. Co., Akron, Ohio.

GRINDERS, PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND-TOOL POST, FLOOR AND BENCH
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The,
Holden Co., Ltd., The, Montreal.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Mich.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING PANS
National Engineering Co., Chicago, Ill.

GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT ANGULAR
Pangborn Corporation, Hagerstown, Md. U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT STEEL
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEATING
Skinner Bros. Mfg. Co., St. Louis, Mo.

HOISTS, CHAIN AND PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Northern Crane Works, Walkerville.

HOT BLAST HEATERS
Robert Gordon, Inc., Chicago, Ill.

INDUSTRIAL ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.

IRON CEMENTS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

IRON FILLER
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Woodison, E. J. Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crusbed Steel Co., Pittsburgh, Pa.

JOLT MACHINES AND SQUEEZERS
Grimes Molding Machine Co., Detroit, Mich.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J. Co., Toronto, Ont.

LADLE HEATERS
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J. Co., Toronto, Ont.

LINSEED OIL, CORE
Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
Frederic B. Stevens, Detroit, Mich.
Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

METALLURGISTS
Charles C. Kawin Co., Toronto.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLS, SAND MIXING AND COMPOUNDING
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip. Co., Akron, O.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Mich.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
Blystone Mfg. Co., Cambridge Springs, Pa.
Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

MIXERS
National Engineering Co., Chicago, Ill.

MOLDS, GAGGER
Wadsworth Core Machine & Equip. Co. Akron, O.

MOLDERS' TOOLS
Dominion Foundry Supply Company, Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Berkshire Mfg. Co., The
The Cleveland Osborn Mfg. Co., Cleveland, O.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Hamilton Facing Mill Co., Hamilton, Ont.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND
Woodison, E. J. Co., Toronto, Ont.

MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.

SAND RAMMERS, (PNEUMATIC)
Cleveland Pneumatic Tool C., The.

NITROGEN
Dom. Oxygen Co., Toronto, Ont.

NOZZLES, SAND BLAST
Frederic B. Stevens, Detroit, Mich.
Panghorn Corporation, Hagerstown, Md., U.S.A.

NORTH RIVER SAND
Pettinos, George F., Philadelphia, Pa.

OIL AND GAS FURNACES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

OILSTONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

OPEN HEARTHS

OVENS FOR CORE-BAKING AND DRYING
Electric Furnace Construction Co.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
W. W. Sly Mfg. Co., Cleveland, Ohio.

OXY-ACETYLENE AND OXY-HYDROGEN WELDING AND CUTTING EQUIPMENTS
Holden Co., Ltd., The, Montreal.

OXYGEN
Dom. Oxygen Co., Toronto, Ont.

PANS, WET AND DRY
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.

PATTERN MAKERS
Downer Pattern Works, Toronto, Ont.
Hamilton Pattern Works, Toronto, Ont.
Modern Pattern & Machine Co., Ford City, Ont.

PATTERN MAKERS' BENCHES
Diamond Clamp & Flask Co.
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machy. Co., Preston, Ont.

PATTERN SHOP EQUIPMENT
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP MACHINERY
Preston Woodworking Machinery Co., The

PATTERN WAX
United Compound Co., Buffalo, N.Y.

PIG IRON
A. C. Leslie & Co., Ltd., Montreal, Que.
Steel Co. of Canada, Hamilton, Ont.

PIG IRON BARROWS
Sterling Wheelbarrow Co., Milwaukee.

PIPE, BLACK AND GALVANIZED
Crane Ltd., Montreal.

PIPE JOINTS COMPOUNDS
Crane Ltd., Montreal.

PHOSPHORIZERS
Frederic B. Stevens, Detroit, Mich.
Joseph Dixon Crucible Co., Jersey City, N.J.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

PLATES, STEEL BOTTOM SNAP FLASK
Wadsworth Core Machine & Equip. Co., Akron, O.

PLATES, STEEL CORE DRYING
Wadsworth Core Machine & Equip. Co., Akron, O.

PLUMBAGO
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.

PNEUMATIC TOOL LUBRICANTS
Holden Co., Ltd., The, Montreal.

PNEUMATIC TOOLS
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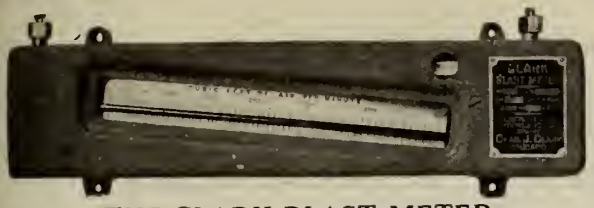

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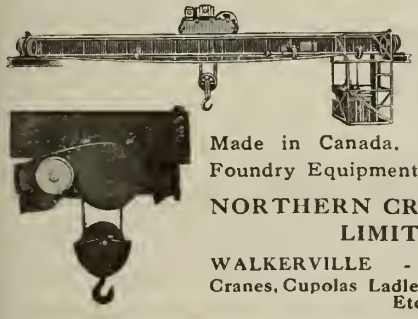

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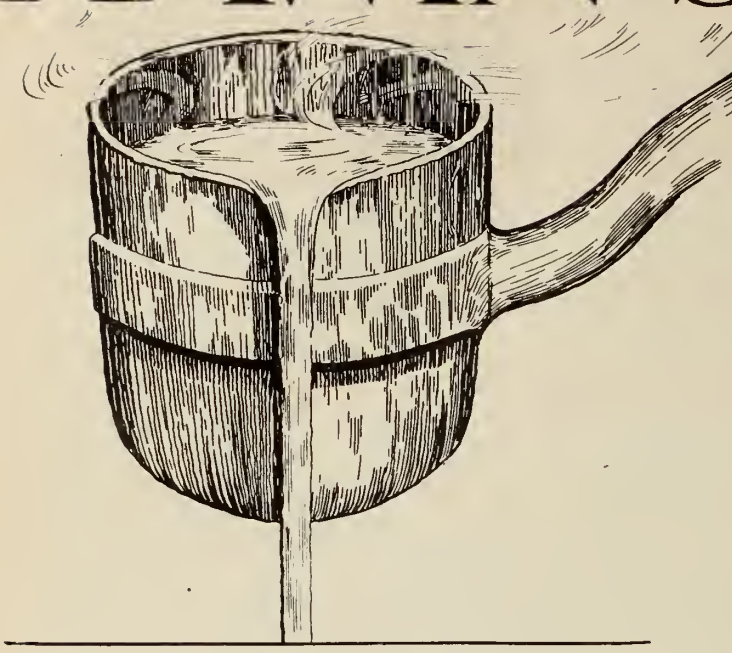

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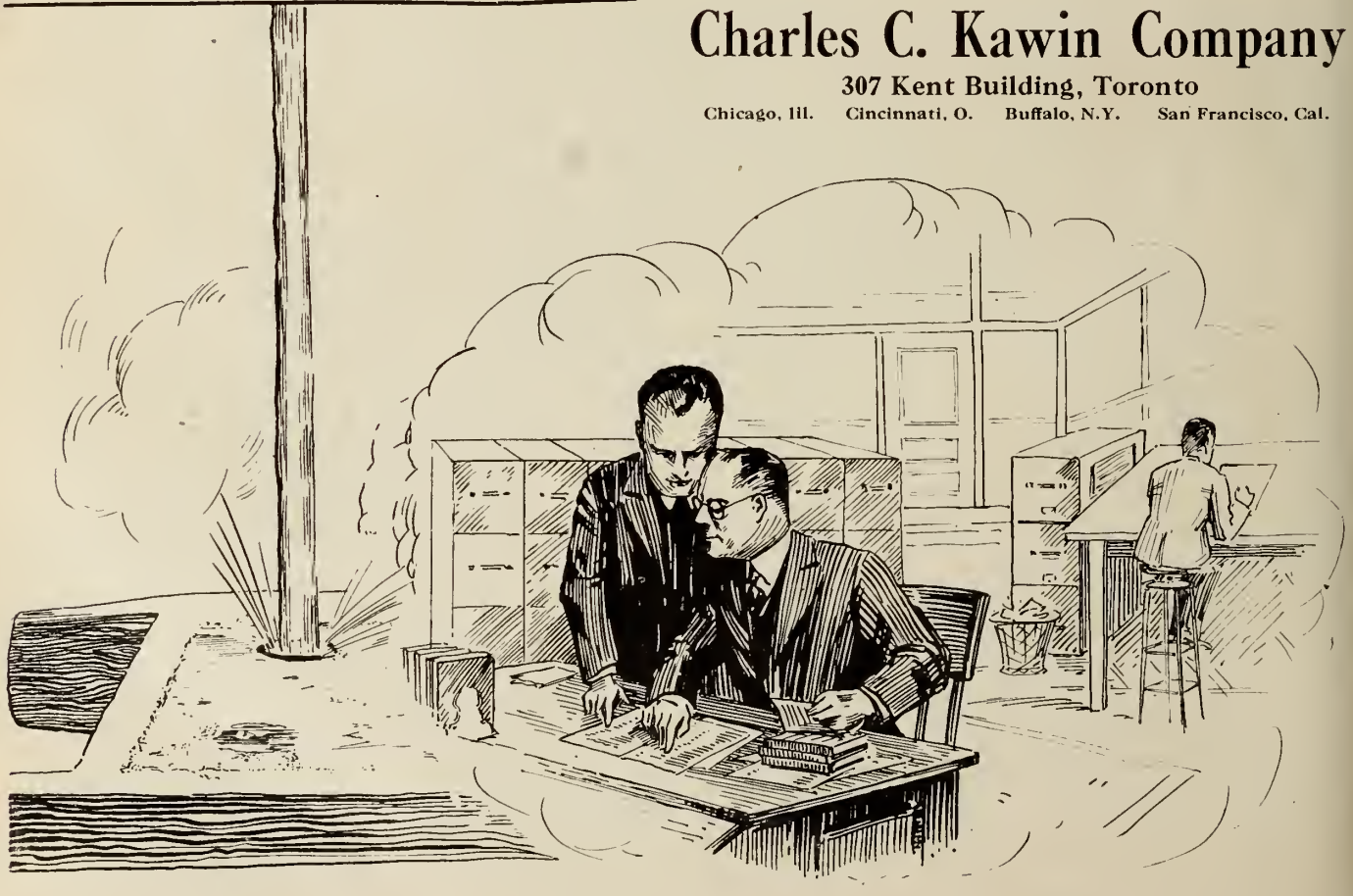
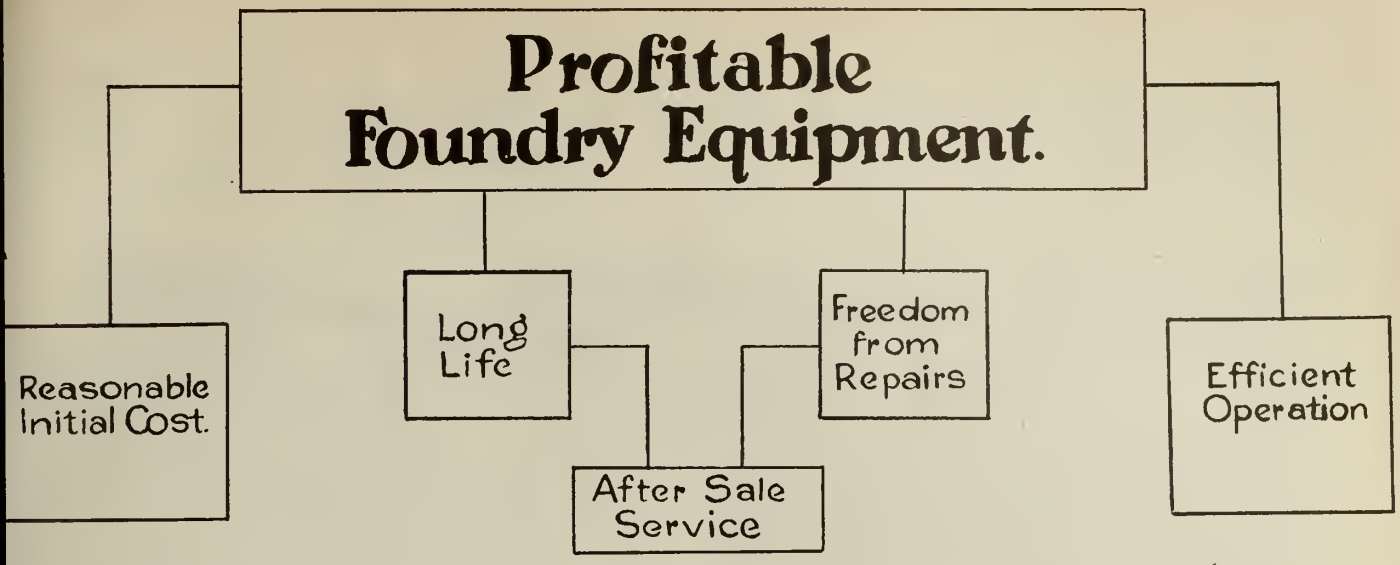




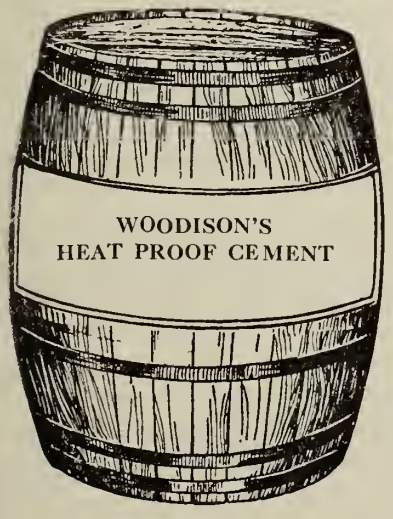
THE WOODISON LINE

of Foundry Equipment is open to comparison for all round profitableness. By Profitableness we mean equipment that meets most nearly the five specifications on the chart above.

Examine this chart carefully. It should be your guide to buying—even as it has been our guide in manufacturing high grade Foundry Supplies.

By striving to put into all our products each of the five essentials shown above, we have become universally acknowledged as the house of best Foundry values.

What are your requirements?



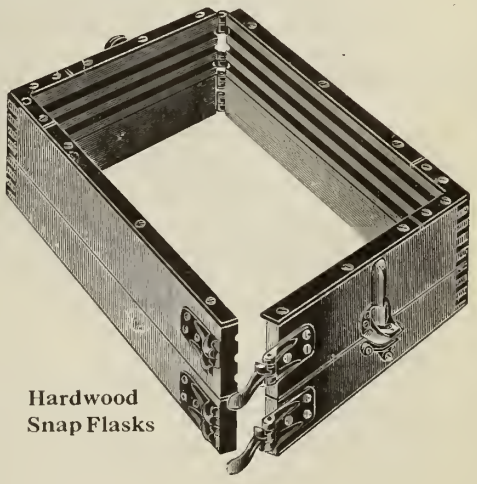
Made in Canada

Heat Proof Cement

This plastic asbestos compound sets hard as a rock and is absolutely heat-resisting. Used extensively for: Boiler Settings, Bridge Walls, Boiler Arches and Fire Door Linings, Annealing Furnaces, Billet Heating Furnaces, Case Hardening Furnaces, Brick Kilns, Forge Furnaces, Heat Treating Furnaces.

Hardwood Snap Flasks

Woodison flasks are strong and durable; there is no danger of their springing and making a shift in your castings. Snaps are quick-acting, hinges fit snugly and work easily. Standard sizes and shapes made promptly to order.



Hardwood Snap Flasks

The E. J. Woodison Company, Limited

Foundry Requisites, Fireclay, Firebrick and Equipment

Toronto, Ontario

Branch Warehouse: 261 Wellington St. W., Montreal, Que.

Foundry of Saco-Lowell Shops, Newton Upper Falls, Mass.

Do You Want a Well-Lighted, Well-Ventilated, Smooth-Working Foundry?

That is what our service offers you.

No frills, no superfluities—no gears with thirteen teeth where twelve will answer—nothing more nor less than a first-class machine for the production of your particular kind of castings, is what a Lane-designed foundry represents.

Material handling yards have to be designed to fit local conditions. This one is capable of considerable extension and so arranged that all material can be unloaded and landed on the charging platform with minimum work. The latter, as will be seen, is under shelter.

Don't let your present indecision drive you away from the proper mark in thinking of your foundry that is to be. Write us for an appointment—there is no obligation incurred—and let us tell you and show you why our services are well-nigh indispensable in the design and layout of a really modern and efficient foundry.

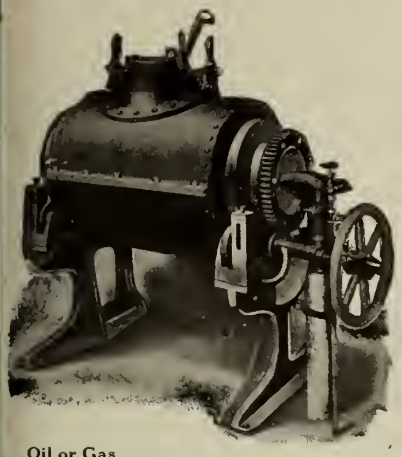
THE H. M. LANE COMPANY

Industrial Engineers and Foundry Specialists

OWEN BUILDING, DETROIT, MICH.

Canadian Office: The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.

MONARCH FURNACES



Oil or Gas
MONARCH-ROCKWELL SIMPLEX—*No Crucible*

MONARCH Double Chamber Melting Furnaces are 50 per cent. more economical than any other furnace. They burn Oil or Gas, require less space, less fuel, and less attention.

They actually do twice the work in half the time. They utilize all the heat from the single burner. While melting in one chamber the exhaust heat (something that other furnaces waste) is used to bring the metal in the other chamber to the melting point, if desired.

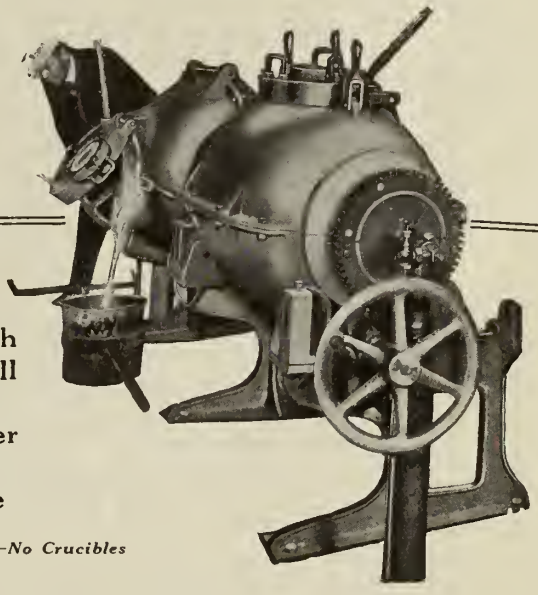
Monarch Single Chamber "Simplex" Furnaces are built on the same lines as the double chamber furnace but without its continuous heating capacity. Best fuel economizer of its kind.

Add a Few More Hundred $'s To the Credit Side This Year

A Monarch Double Chamber Furnace Means a 50% Saving!

If your Foundry is fairly well equipped and you have every operation down as perfectly as clockwork—then you **may** get along without a MONARCH and show a good profit. Still, you can use a few more hundred dollars this year, can you not?

But if your foundry is not as well equipped in other respects, and if your present profits are not high—then a MONARCH MELTING FURNACE is a veritable Godsend to you.



Monarch Rockwell Double Chamber Melting Furnace

Oil or Gas—No Crucibles

Don't delay, but write at once for our catalog CF, 1921. It describes fully Monarch Furnaces for coal, coke, oil and gas. Every minute you delay means wasted profits.

The Monarch Engineering & Mfg. Co.

1206 American Building BALTIMORE, MD., U.S.A.

WORKS: CURTIS BAY, MD.

TRUSCON STEEL CO
TRUSCON
PRESSED STEEL

STRENGTH

Without Excess Weight

YOUR moulders are expending their strength in lifting tons of unnecessary weight if they are doing their moulding with old-fashioned flasks. You pay for this wasted energy. The use of Truscon Flasks eliminates this waste and permits more and better work.

Truscon Flasks are designed to have ample strength without excess weight. The thickness of the shell varies from ⅛″ to ¼″, depending upon the size of the flask, the weight of the sections and the kind of metal to be poured.

Users of Truscon Flasks find that they conserve the energy of their workmen and secure bigger production—the design of Truscon Flasks permits the use of less sand.

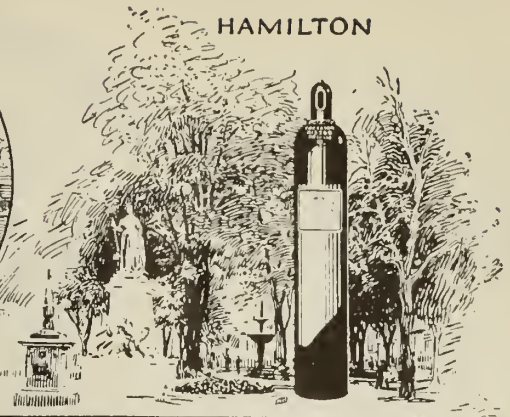
Truscon Flasks are built to stand strenuous duty. They are formed of special Truscon Alloy Steel Plates. The deep ribs and broad flanges give to the steel shell exceptional strength and rigidity. **They possess other features of construction which should prove interesting to you—write for full details.**

TRUSCON STEEL CO

YOUNGSTOWN, O.

Warehouses and Representatives in Principal Cities

TRUSCON FOUNDRY FLASKS



Dominion Oxygen

A Canadian Product at the Disposal of Canadians

DOMINION Oxygen of the highest and most uniform purity is now being supplied to users throughout Canada from five perfectly equipped distributing stations. At Toronto, Hamilton, Montreal, Welland and Windsor are efficiently organized forces whose business it is to insure prompt delivery of your oxygen requirements.

Wherever your location, whatever quantity of Dominion Oxygen you may need—your order will be filled on the day it is received. It is through such service that the Dominion Oxygen Company Limited has secured the generous patronage of Canadians, which it hopes to continue to merit.

DOMINION OXYGEN COMPANY, LIMITED

Hillcrest Park, Toronto

Hamilton, Montreal, Welland, Windsor

D-17

Cuts Cleaning Costs

The Effective Enduring Abrasive

It's the impact in blasting that does the work. **Sand** under impact crushes quickly and pulverizes to dust. It must be replaced by **new** sand frequently. Globe Chilled Shot can be used 250 to 275 times before it becomes ineffective. It reduces storage bins; eliminates sand driers; reduces labor costs.

Send for samples.

GLOBE CHILLED SHOT

It gives you a better and quicker Blasting Job at a reduced cost.

THE GLOBE STEEL COMPANY, Mansfield, Ohio, U.S.A.
In Canada: Canadian Johns-Manville Company, Asbestos, P.Q.

Let a
HAUSFELD
Cut Your Melting Cost

By accomplishing a more perfect heat distribution the Hausfeld Tilting Melting Furnace makes better melts in less time. Can be had with or without fuel oil feeder.

Tilting Crucible Melting Furnace

COMPLETE UNIT Gas or Oil

The complete unit feature enables either gas or oil heating. In case of emergency this is of great value. No equipment other than piping to gas meter and fuel oil reservoir is necessary. Send for complete description.

Manufactured only by
THE CAMPBELL-HAUSFELD CO.
General Offices and Works: HARRISON, OHIO
Canadian Representatives
THE E. J. WOODISON CO., LTD., TORONTO ONT.

Exhaust Tumbling MILLS

Constructed of heavy steel plate

BUILT for long, heavy service, McDougall mills are in all respects high-class products. Equipped with renewable inside end linings, ring oil bearings and many other improved features.

Write for Literature.

Single File Tumbling Mill

Manufactured in Canada by
THE R. McDOUGALL CO., LTD.
GALT, ONTARIO

Speed and Ease Accomplished on a Heavy, Rigid FORD-SMITH GRINDER

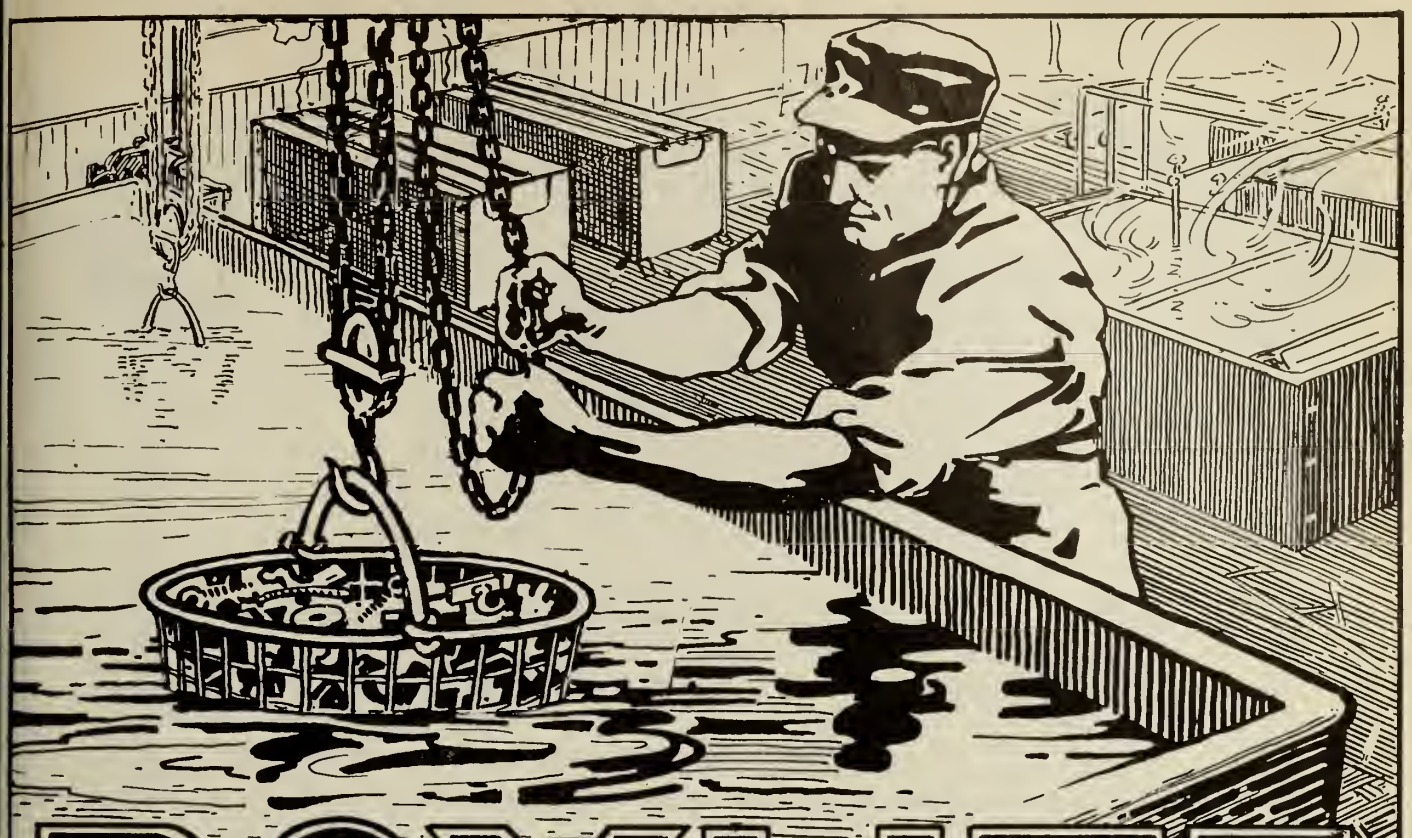
Heavy Type Grinders

Our new line of floor grinders has been designed to put these machines on a really efficient basis. All types are of the strongest and most rigid construction. Even the highly skilled mechanic will find a great difference in the quality of work and the ease and speed with which it is done.

Full specifications, prices and photographs will be mailed upon request.

The Ford-Smith Machine Co., Limited
HAMILTON, CANADA

Foreign Agents: W. E. Storey, London, Eng.
British & Canadian Hydraulic Tube Co., Johannesburg, South Africa
Gollin & Co., Melbourne, Australia
McLeod & Co., Calcutta, India



ROYLITE
CLEANER

A New Discovery!

ROYLITE Cleaner represents the very latest and most successful development in the process of chemically removing oil, grease, enamel, paint or any kind of dirt from metal in the quickest and most thorough manner.

Formerly most cleaning solutions consisted of caustic soda, potash or lye which saponified grease and acted like a soap. The alkali strength was quickly used up because the action caused a precipitate and heavy sediment formed at bottom of solution.

The new Roylite process emulsifies mineral oil and heavy greases which cannot be saponified, by lifting them from the work to top of solution, thereby avoiding the precipitate action, making it unnecessary to throw out solution but merely add small quantities to sustain its strength.

Guaranteed not to discolor or tarnish the brightest surface.

Our men will gladly give you demonstrations. Order a barrel to-day on approval.

Lasts longer — Works quicker — Costs less

Manufactured by

CANADIAN HANSON & VAN WINKLE CO. LTD.

TORONTO, ONTARIO

"MADE IN CANADA"

CLEANS ALL METALS

Sterling

Line Of Foundry Barrows Is Complete

No need to waste time and effort in trying to adapt the load to a wheelbarrow, when you can get a Sterling barrow that is exactly fitted to the work.

There are Sterlings for sand—for pig iron—for coke—in fact, for every foundry material-handling job. Each designed and built for its particular work—but all have the exclusive Sterling qualities.

Why not write today for your copy of the Sterling Catalog and select the barrow suited to your needs.

The Only Line Of Rolled Steel Flasks

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

STERLING WHEELBARROW COMPANY

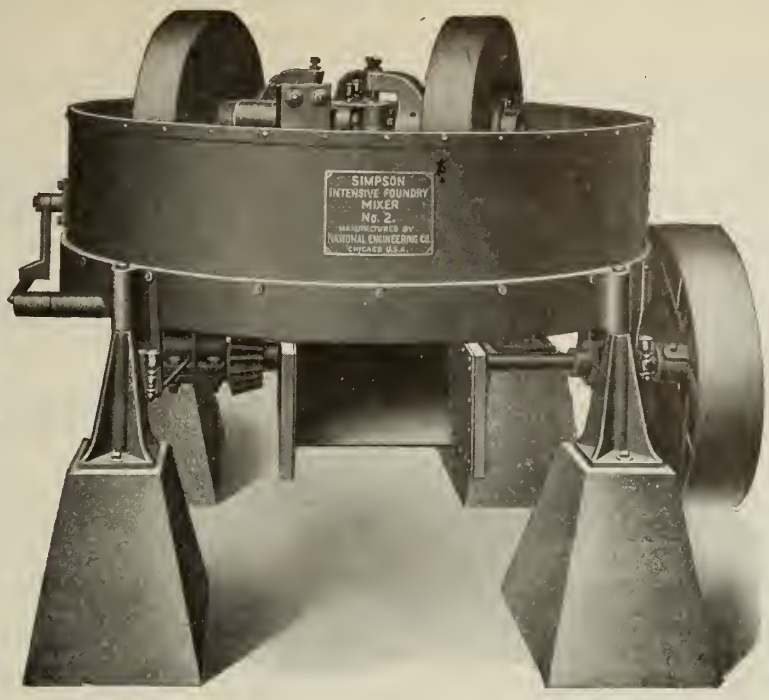
NEW YORK
BOSTON
CLEVELAND

MILWAUKEE, WIS.

DETROIT
CHICAGO
ST LOUIS

CANADIAN AGENTS-MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VANCOUVER

Adopt a SIMPSON MIXER for Quality Castings



"Product of a Practical Foundryman"

Adopt a SIMPSON MIXER for Economy

SIMPSON INTENSIVE FOUNDRY MIXER

PUT your foundry on a more profitable basis by adopting a Simpson Intensive Foundry Mixer. Then you're through with mixing delays and labor hold-ups. You get quicker, better quality sand mixtures. And, best of all, you're saving money every hour it operates.

In progressive shops all over Canada and the States Simpson Mixers are doing their part to make quality production. Their users appreciate the Simpson Advantages listed to the right!

Write for our pamphlet No. 50 and list of many users.

Points of Perfection

- Correct size and speed of mullers.
- Effective arrangement of plows.
- Large capacity per area of floor space occupied.
- Minimum power and maintenance cost.
- Considerably less new sand and binder required.
- Automatic Discharge.
- Saves Labor, Binder, and New Sand.
- Improves the quality of the castings. Work is done thoroughly, not partially. Elasticity and toughness of sand are enormously increased.

NATIONAL ENGINEERING COMPANY

Machinery Hall Bldg., 549 W. Washington St.
CHICAGO, Ill.

Subtracting from Your Biggest Casting Cost!

Type V Ma-chine. Equipped with one-sixth H. P. motor and 20-in. sieve.

THE time of your employees is the most expensive thing which enters into the cost of castings. Every Saturday night a liberal percentage of your payroll goes for time spent in screening sand. You can shave this sand screening time to the minimum with a Combs Gyratory Foundry Riddle. This machine will sift sand faster than one man can shovel into it, and will also screen more sand than ten laborers using hand riddles.

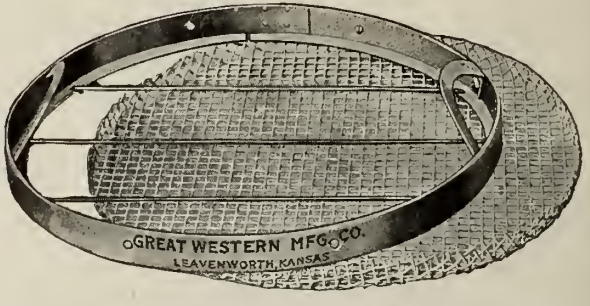
COMBS GYRATORY FOUNDRY RIDDLE

is in every sense a time saver. Weighing but ninety pounds, a man can easily pick it up and carry it wherever needed, and when suspended from a trolley on a wire cable the Combs Riddle will supply as many as twenty moulders with sand.

Because it operates with a true gyratory sifting motion the Combs Riddle requires few repairs and has double the capacity of ordinary riddles. The Combs Riddle produces evenly **mixed** and tempered sand, which insures a better mould. The small motor used makes power bills practically negligible.

Note these Features!

No legs in the way of shovel. Run a wheelbarrow right under it.
The motor is totally enclosed.
Only one bearing outside the motor.
There are no gears.
Economical to operate.



Every Combs Riddle is equipped with a heavy steel sieve. This is held in place by an improved clamping device which enables the operator to remove, dump and replace in a second.

The Comb Riddle is made in Toronto, Canada, and you pay for it in Canadian Dollars. Clip this ad.; place it in an envelope addressed to us and we will send full particulars. Write direct to

Great Western Manufacturing Company
LEAVENWORTH, KANSAS

This photograph was taken in SEPTEMBER, 1902, in Mr. McLain's office while superintendent of the National Brake & Electric Co., Milwaukee, Wis.,—the first in the United States to have iron, steel and brass foundries under one roof.

The photo was taken a few days after machining his first batch of semi-steel cylinder heads—weighing 35 pounds—5-16″ section—air pressure 200 pounds per square inch. The machine shop foreman said: "99 machinists out of 100 would say that it is a close-grained iron and would never imagine it is semi-steel."

Instead of applying for a patent and making an exorbitant charge, Mr. McLain gave his formulas and advice on semi-steel to all foundrymen who desired it.

Even in those days he realized that the name "semi-steel" was considered a misnomer, but he believed that McLAIN'S SEMI-STEEL WAS A NEW METAL, strong enough to stand on its own merits irrespective of the name.

Through the advertising columns—articles—and thousands of letters sent yearly, he fought and is still fighting **tradition and rule-of-thumb methods.**

From 1903 to 1908 Mr. McLain systematized many foundries, and through this experience he conceived a "GREAT IDEA" which was:—As he could not reach all foundrymen personally, why not arrange his formulas into concise form in order to teach foundrymen everywhere?

In 1908 he resigned a lucrative foundry position to devote his entire time and attention to simplify the chemistry of iron and steel, translating the scientific problems and technical terms into plain foundry language known as McLAIN'S SYSTEM of practical metallurgy, covering gray iron, semi-steel and steel foundry practice.

Foundrymen everywhere now reap the benefit of his great idea, for McLAIN'S SYSTEM shows them the secret of production at least cost.

McLain Men Are Not Promised Positions in Order to Secure Their Enrollments—That's Why You Should Have a McLain Man in Your Shop.

SEND FOR FREE SYNOPSIS

McLAIN'S SYSTEM, INC.

700 Goldsmith Bldg.

MILWAUKEE, WIS.

McLAIN'S SYSTEM, INC., 700 Goldsmith Bldg., Milwaukee, Wis.
I am interested in:
Semi-steel
Gray Iron
Cupola Practice
STEEL
Crucible
Converter
Electric
Open Hearth
Name .....
Address .....
Firm .....
Position .....
5-21

SERVICE

To foundries is our specialty in foundry equipment.

We can reduce your foundry costs by saving you the Supply Company's Profit.

BUY DIRECT

FROM THE MANUFACTURER

Our lines comprise the highest grade in foundry equipment

Flat bottom steel ladle bowls, capacity 50, 100, 150, 200, 250, 300, 350. These bowls have heavy steel plate sides and bottoms.

Crane Ladle Bowls from 400 to 2,000 pounds.

These Ladles have catch on side of bowl to hold it in upright position.

Write us for prices on your requirements in

Ladle Bowls, Shanks, Steel Bands, Steel Slip-over Jackets, Steel Core Plates, Wooden Snap Flasks, and our All-steel Core Oven.

Do not hesitate to write us for any information you may desire.

DAMP BROS.

Manufacturing and Welding Co.

852 Dupont Street
TORONTO, ONTARIO

MOLDING SANDS

for

Steel, Malleable, Brass, Aluminum and Light Grey Iron Castings

Manufactured by Venango Sand Co., Franklin, Pa., are not equalled by any other sands on earth—we guarantee this. We also give service.

VENANGO SAND CO.

FRANKLIN, PA.

REYNOLDS

FOR GOOD

CORE OIL

The Best—and Why

We have concentrated many years of experience in making one grade of core oil. Naturally we have aimed to produce the BEST! That we have succeeded is borne out by the satisfaction it always gives. Highest grade for 20 years. Write for prices.

REYNOLDS & COMPANY

261 Macdonell Ave.
TORONTO

"VOLTA"
Electric Furnaces

ELECTRIC STEEL FURNACES
100 lbs. to 15 tons Capacity

GRAY IRON CASTINGS
Electric Furnaces for making Gray Iron

ELECTRIC BRASS FURNACES
Made in standard sizes of ⅛, ¼, ½ and 1 ton capacity.

Electric Furnace Accessories of All Kinds

In order to meet and overcome strong competition you should reduce your production costs as well as metal losses. This can unquestionably be done by operating an electric furnace. Let us convince you that this is true.

The Volta Manufacturing Company, Ltd.
WELLAND, ONT.

FOUNDRY PRODUCTION

WE DESIGN
- Industrial Plants
- Power Plants
- Foundries
- Machine Shops
- Bridges
- Hospitals
- Banks
- Public Buildings

AND MAKE
- Reports
- Estimates
- Appraisals

Adequate foundry facilities, ample floor space, proper ventilation and lighting are features in foundry design, which, in connection with operating efficiency, will insure maximum production.

It will pay you to consult us on your foundry problems.

The Osborn Engineering Co.
CIVIL, MECHANICAL, ARCHITECTURAL ENGINEERS
2848 PROSPECT AVE. CLEVELAND, O.

What are Your
SAND
Requirements?

We are supplying the needs of many of Canada's largest foundries. They reorder from us because we give them satisfaction—in quality, price and prompt deliveries.

3 Grades Moulding Sand
3 Grades Pipe Sand
3 Grades Core Sand

A Partial List of our Satisfied Users

American Radiator Co., Buffalo.
Niagara Radiator Co., Buffalo.
(The above two ordered 150 and 100 cars respectively in 1920)
Erie City Iron Works, Erie, Pa.
Dom. Wheel & Foundries, Toronto.
Fittings Ltd., Oshawa.
Can. Fairbanks-Morse Co., Toronto.
Can. General Electric, Toronto.
Can. Iron Foundry, St. Thomas.
Grand Trunk Railway System, Montreal.
Victoria Foundries, Ottawa.
International Malleable Iron, Guelph.
Katie Foundry, Galt.
Goldie & McCulloch, Galt.
International Harvester Co., Hamilton.
Dom. Steel Products, Brantford.
Can. Westinghouse Co., Ltd., Hamilton, Ont.
Wm. Hamilton & Sons, Peterboro.

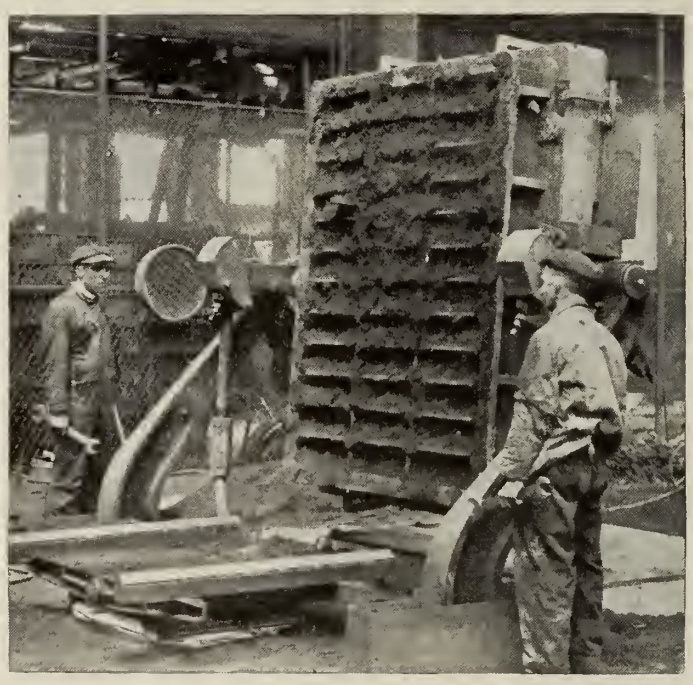
Any Kind of Building Sand

We have a grade of sand for every purpose. State your requirements and we will gladly send samples. Distance is no object. Write to

Benson & Patterson
STAMFORD, ONT.

Herman Jarr Independent Rollover and Pattern Drawing Machines

If It's a Herman It's Worth Using



It Made Its Way by the Way It's Made

For Medium or Larger Work

IT PAYS to use the best, so long as the price is not exorbitant. By using any other you are losing efficiency.

Foundrymen who have used a Herman Jarr Independent Rollover and Pattern Drawing Molding Machine invariably consider it the worthy choice of any foundry.

Let our Service Department help you determine your molding machine requirements.

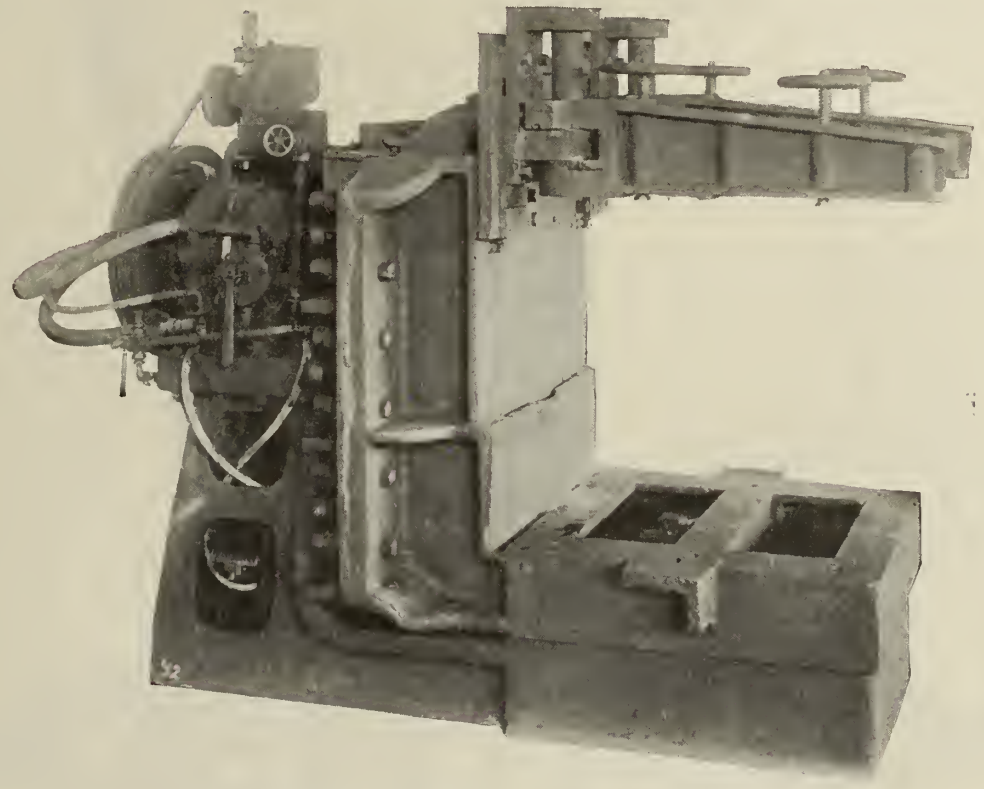
Herman Pneumatic Machine Company

GENERAL OFFICES: Union Bank Building, PITTSBURGH, PA.

MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U.S.A.

Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London, S.W., Eng.

GRIMES Rollover Molding Machines



MODEL K 1014, 2,500 lbs. LIFTING CAPACITY

Produce Better Castings for Less Money

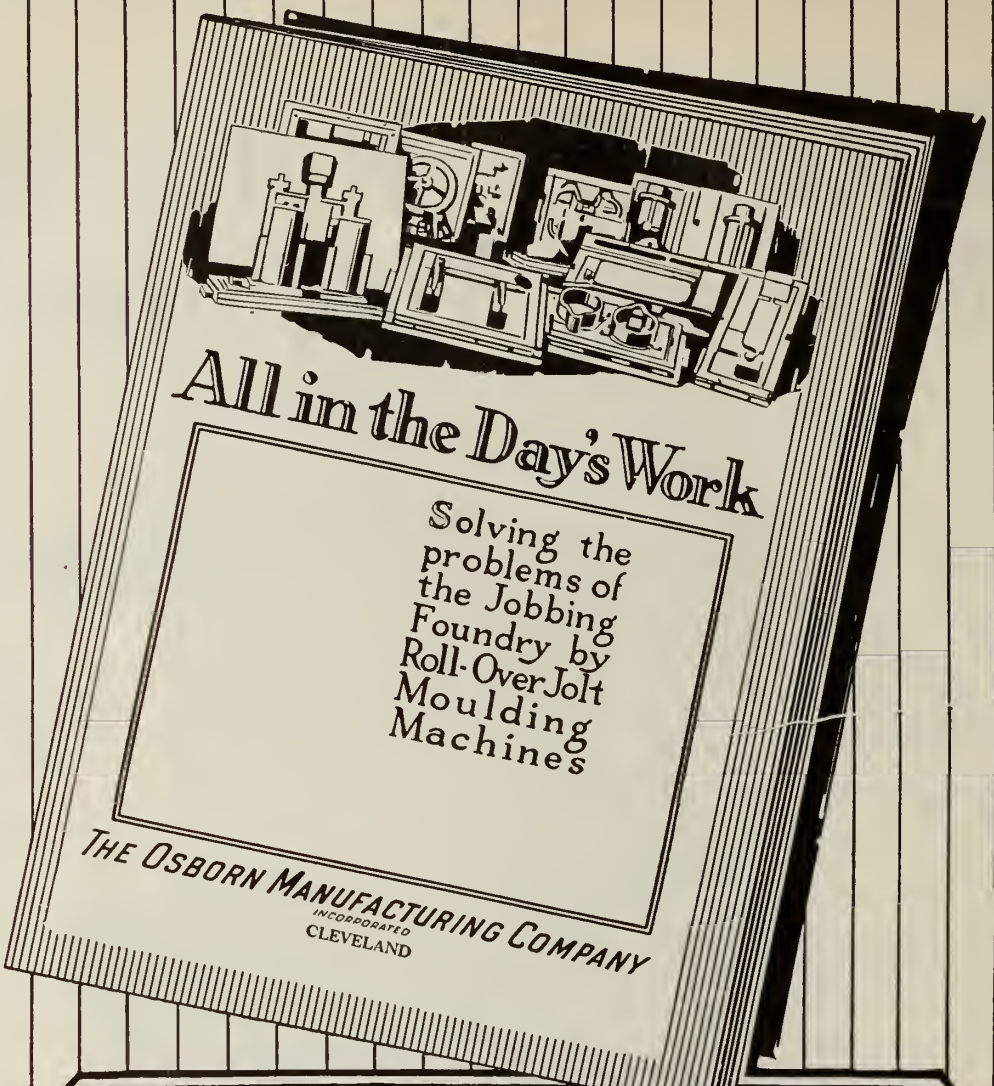
Simplicity of Design
Ease of Operation
Low Cost of Installation
No Pits to Clean
Entirely Above the Floor
Little Space Required
Investigate

We would be glad to show you how the Grimes can cut your costs and boost production on your work. Write for catalogue and full details.

Grimes are made in many different types in both hand and power models up to 5,000 lbs capacity, for use on a wide variety of work.

GRIMES MOLDING MACHINE CO.

5736 Hastings St. - - - DETROIT, Mich.


All in the Day's Work
Solving the problems of the Jobbing Foundry by Roll-Over Jolt Moulding Machines
THE OSBORN MANUFACTURING COMPANY
INCORPORATED
CLEVELAND

OSBORN

Send for this new 16-page book

"All in the Day's Work" is not a work of fiction but a definitely-detailed analysis, with exact figures, of what an actual jobbing foundry is accomplishing by the use of Osborn Moulding Machines. It is yours on request.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
CLEVELAND
New York San Francisco

The coupon makes it easy to write

Name .....
Company .....
Address .....
City ..... Province .....
Kind of Work .....
We use moulding machines do not

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Member of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

The Water-fall, the Water-wheel and the Dynamo

How the Waters From the Snow-Capped Rocky Mountains Pass Through One Power Plant After Another in Their Long and Tortuous Journey Down the Mountain Side

By F. H. BELL

ELECTRICITY and its adaptability to the foundry is a subject which I have been endeavoring for some months past to impress upon the mind of readers of Canadian Foundryman, particularly those who are in the business and who are most likely to be interested in the subject of power.

While doing my best to get reliable data on the subject, I do not want to be misunderstood and classed as an electric enthusiast. I am enthusiastic over anything which is a success or which could be made a success.

Electricity has many advantages which are not to be found elsewhere, but, of course, electricity is not everything. Coal, either as it comes from the ground or in the form of coke or gas, is a commodity which will be hard to surpass, while petroleum and its products are in the race and must be reckoned with, and the old reliable wood pile is still holding its own in some localities.

Canada probably has as much energy stored up in her forests as any nation in the world, and she also has her share of the world's known coal, and in Northern Ontario she has some most promising oil prospects. But, as I pointed out last month, right in the busiest part of the Province of Ontario and in the entire Province of Quebec we have had to a great extent to depend on wood for power and when it began to show signs of becoming scarce in the older parts of the country we were driven to use imported coal.

Coal has now also become almost a luxury in these particular parts of Canada, so that it behooves us to see what else we have to fall back upon, and electric energy, generated from our numerous waterfalls, would seem to, at least, partly solve the problem. Canada is certainly well provided with water-falls.

As far back as history goes, water-wheels have been used to furnish power, and they were coupled up direct to the machinery which was to be driven, but since the advent of the electric motor the water wheel has become exceptionally prominent. While we are in a position to do a little bragging about the enormous turbines and dynamos which are being built for the Ontario Hydro-Electric Power Commission, and which surpass in size anything ever attempted before in any country, we also realize that there are others and a few items of information regarding them will be read with interest by readers of Canadian Foundryman.

Canadian Foundryman, as might be expected, is read by those interested in foundry work in every part of the world, and one of our readers, Mr. W. G. Leishman, of San Francisco, after reading these articles, has contributed an exceptionally interesting article on the molding of a bronze runner in the shop where he is employed. This article appears in another part of this issue, and in the description of the runner it is specified that it is to work under an 800-foot head. The 800-foot head seemed rather interesting, so we busied ourselves to find out where this head was located. With Mr. Leishman's assistance, and through the courtesy of Mr. David Donzell, vice-president of the Pelton Water Wheel Co., of San Fran-

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cisco, we are able to furnish our readers with a fairly graphic description of how the snow from the top of the Rocky Mountains is made to work its passage down the hillside until it finally finds itself irrigating the land in lieu of the rain which Nature neglected to provide in some localities.

While strictly a power proposition it is nevertheless of vital interest to the foundryman, inasmuch as every one of these waterwheels and every dynamo and most of the transmission machinery has its origin in the foundry. Mr. Leishman's article will give some insight into what the moulder and coremaker is up against in producing one of the parts which go to make up a water wheel, and the article which we published in February on molding and casting dynamo castings and which we are continuing in the present issue, will show what an important item electrical machinery is in the foundry, so that all told the waterfall, the water wheel and the dynamo make up a combination of subjects which are equally as interesting to the foundrymen as to any other class of men in the world.

The beautiful verse written in 1855 on the subject of the waterfall and the water wheel makes a fitting prelude to Mr. Donzell's story, and shows the esteem in which these two units were held a half a century ago. The electric dynamo was unknown in those days, or it might also have been included, although some of its deeds and some of the duties which it is forced to perform are far from angelic.

The Waterfall

At every waterfall two angels stay,
One clothed in rainbows, the other veiled in spray;
The first the beauty of the scene reveals,
The last revolves the mighty water wheels;
And there those white-robed sisters ever stand—
Utility and Beauty, hand in hand.

Following is Mr. Donzell's article, which tends to explode the old saying that, "The mill will never run with the water that is passed."

What Mr. Donzell Says

One of the most important factors in the future industrial development of all countries alike is the development of the vast water power resources — nature's gift to mankind, the majority of whom have either assumed the impression or have been misled into believing that all beautiful and natural waterfalls must be destroyed to develop this power and many articles written by those who opposed the Federal Water Power Bill, which was recently passed by Congress, were very impossible and were accompanied by many exaggerated illustrations.

Although "fall" is necessary to produce pressure, which in turn is necessary to drive the water wheels, it can be produced by many different methods other than by standing a pipeline on end under a waterfall as some artists have chosen to illustrate this idea.

The water must be conducted down from a higher elevation through a pipe line and on to the wheel. This "height of fall" or "head," as it is generally called, is the vertical distance between the level of the water at the entrance of the pipeline in the ditch or reservoir and the location of the water wheel at the bottom of the hill. Water power developments may be divided into three classes, but to give a more thorough description of the method in securing this "height of fall" or "head," we will use the most commonly used in "high head" development. That is where storage reservoirs are constructed in some favorable location where water-shed from snow-covered mountains, springs, streams and spring freshets can be stored in large quantities and the surplus drawn as needed.

We will use as an example one of the power projects in California, where "high head" is most commonly used, there being, in a way, many like conditions. First the storage reservoir was constructed at the narrow outlet of a rocky valley and consists of a rock-filled structure of 150 feet high and 562 feet wide, and has a storage capacity of 790,000,000 feet over an area of 232 acres. Many tons of rock are used in this type of construction and in this case 150,000 cubic yards of granite was used. These dams are more often of concrete.

UTILIZING THE POWER WHICH IS HERE GOING TO WASTE WOULD NOT IN ANY WAY IMPAIR THE BEAUTY OF THE WATER-FALL.

The outlet is provided from the bottom of the structure through a concrete culvert containing three 33-inch pipes, through which the flow is regulated by three 30-inch valves.

The water is permitted to flow through these openings into the river and continue on its semi-natural source for forty-five miles down the river canyon, where another dam has been constructed—this, however, is not for storage, but is a diversion dam 20 feet high, which raises the water to the necessary level and for diverting a certain per cent. of the flow into a settling basin provided with eight sand pipes to carry off the sand deposits carried down the river. Ten head gates—3 feet by 9 inches by 7 feet—are employed to control the flow of water into this basin, from which it flows into a wooden flume, which is 6 feet high, 9 feet wide and 78,000 feet long. The construction of these flumes is usually very difficult, and many different methods are employed in fastening them along the sheer walls of the canyon, which are usually of solid rock formation. This flume, however, is the method employed to conduct the water to the higher elevation to secure the fall, since the flume is constructed with a grade of 10 feet to the mile to permit a gravity flow—and the river and general contour of the country having a fall so much greater than that of the flume it can be readily seen that this water so conducted in the flume 15 miles long would attain a very high elevation. At the selected location above the power house side and at the end of the flume is installed the forebay reservoir, which in this case consists of two small valleys, which stand on a high hill 1,500 feet above the selected power site; each of these valleys has been dammed, so as to give a maximum depth of 50 feet and a storage capacity of 14,000,000 feet of water, enough to operate the plant at full capacity for 15 hours. Many different types of construction are employed in forebay construction and in this case a natural advantage existed at this point, and thus warranted the construction employed.

From this forebay the water is carried to the power house by pipe lines, the construction of which and the material of which varies under many conditions, and in this case consisted of two steel pipes 305 feet long, and 60 inches in diameter, joined to 1,200 feet of wood stave pipe, which in turn are connected to 3,000 feet of riveted steel pipe, which reduces to 40 inches diameter at the power house. At the entrance to the power house 20-inch nozzles are provided in addition to 20-inch heavy pressure gate valves, which are operated by water motors and regulate the flow of water on the water wheels, which are direct connected to the generators.

The speed regulation is controlled by oil pressure governors, which are directly connected to and used for actuating the needle deflecting nozzles. A very large safety factor has been employed in the construction of all the water wheel parts and the design of the runner is such that the buckets are not only

secure under usual operating conditions, but are made to safely withstand the impact due to the maximum size of the jet from the nozzle under the full effective head if the wheel were locked in a stationary position, or while running at full velocity.

The power house is situated in a canyon, a sheer 1,500 feet below its rocky rim, where the forebay is located and is the same river canyon from which the water was taken 60 miles above to secure the necessary fall, and after its plunge of 1,500 feet to the water wheels, where its energy is converted to electrical and mechanical power, it is again returned to its original river channel.

Since the passage of the Federal Water Power Bill there has been a total of 170 applications filed for water permits. This would total the development of 15,924,831 H.P. in the United States.

With the 10,000,000 H.P. now being developed in the United States added to the contemplated total, which is now under consideration or construction, this will mean nearly 24,000,000 H.P. against the estimated potential water powers of the United States, which is 60,000,000 H.P.

In California alone there is now being developed 960,000 H.P., while the contemplated development in the very near future will total 2,509,903 H.P., this would total nearly 3,469,903 H.P. developed in California alone, which is against the total potential resources of 9,000,000 undeveloped H.P. These developments in California are brought about by 84 electric utilities in California operating 75 hydro-electric stations.

A POWER PLANT TO THE LEFT OF THIS FALL WOULD HAVE A HEAD AS HIGH AS THE FALL AND THE WATER WOULD DISCHARGE INTO THE RIVER BELOW, LEAVING THE SCENIC BEAUTY OF THE SURROUNDINGS UNTOUCHED.

One would now assume that water having thus performed its duties would be permitted to proceed on its way unmolested, but such is not always true, for in many cases diversion dams are constructed below the power houses, and as the water has spent its power on the wheels and falls away into the tail race, it is again directed into a flume and goes through the same process of increasing its "fall" or "head."

In one case in California the same water is used through five different power houses, and when through its course of many miles of conveyance, it finally reaches the lower valley sections, where but a slight fall can be secured, which would not develop enough energy for power purposes, it is then distributed through canals for irrigation purposes. In the construction of these huge reservoirs or lakes many sections of wild, rugged and barren country are transformed into a beautiful area, where those who have condemned the development of our vast water resources could find beauties equalled to any of those placed before them by nature itself.

It may be interesting to kpow that the cost of constructing this enormous power programme with the resultant service costs for electrical supplies, equipment and power will require $11,000,000,000.

Note.—The views here shown are not from the district referred to by Mr. Donzell but will convey to the reader the ideas advanced in his story. In the first view will be seen the Grand Falls on the White River, in the Province of New Brunswick. On a bright summer's day when rain is out of the question the spray rises far above the upper river, making an ideal setting for the rainbow which usually appears. The two guardian angels have no words over the water being put to work.

In the second view will be seen the Pokiok Falls, also in New Brunswick. If some of the water from the upper level should be conveyed to one side it would drive a turbine and if the water in the lower level has occasion to fall at another point in its course it would drive another, thereby demonstrating the practicability of making it work as many times as it has power left in it.

DANGER LURKS IN THE SCRAP PILE

The scrap dealer who purchases old metal tanks, barrels or cylinders should not fail to ascertain definitely the uses to which such containers have been put. If they have held combustible gases or liquids or even certain dry chemicals they are a serious source of danger.

The following case, which is by no means an isolated instance of the kind, illustrates the point. At a certain Ohio scrap yard some weeks ago an explosion resulted in the death of a workman who was cutting bolt holes in a piece of angle iron. In order to make the work accessible he placed it on a sheet steel drum about three feet high by two feet in diameter. Unintentionally he penetrated the steel sheet of the drum, causing the violent explosion of an unsuspected gas which it contained. Both ends of the drum were blown out, one of the ends and several pieces of angle iron striking the victim of the accident, breaking four of his ribs and puncturing his lungs with fatal effect. An inspection of the drum showed that it had been airtight and had contained a substance resembling sulphur. The dealer stated that he had purchased several of the drums as scrap material some three years previously, and had no idea as to what they had contained.

In many cases the former use of the container may not be suspected, but there are other instances where it should be obvious to a dealer in scrap. For example, everyone engaged in the production of scrap should recognize instantly cylinders used for the storage and transportation of compressed gases. Such cylinders are usually the property of the companies that produce the gases so stored and transported, and their names are generally conspicuously marked on the container in a manner difficult to efface—commonly, by stamping the metal with a die.

Whenever tanks that have been used for explosive gases, liquids or substances are offered for sale as junk, the person offering them should be advised as to their character and warned not to dispose of them for reduction; and the nearest office of the manufacturer, whenever the name is obtainable, should be notified without delay.

One Place That Stumps 'Em

"No city," says a newspaper story, "has yet solved the problem of the reckless automobile speeder."

How about Venice?—Detroit Motor News.

Molding Tapered Pulley from Parallel Pattern

The Straight Pattern Gives a Background to Work Upon—By Building on One Part and Taking Off on Another a Good Job Is Secured

By J. W. TAYLOR

FIG. 1 shows a tapered driving pulley which was ordered as an improvement in the equipment of a paper mill, the method of production being left to the foundryman's judgment. The casting had a three-foot face, was four feet in diameter at the one end and tapered down to three feet ten inches at the other. It weighed approximately 1,000 pounds and as only one was wanted, and no prospect of a repeat order ever coming in, the cost of a full pattern was considered prohibitive, hence the method of production hereafter described.

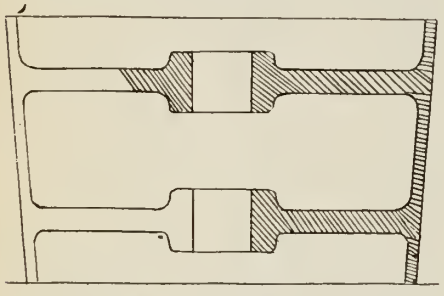


FIG. 1—DOUBLE ARM TAPERED PULLEY TO BE MADE FROM PARALLEL PATTERN.

After mature consideration it was decided to mold the large end up as a number one finish was required on the face. We were fortunate in possessing a fine set of pulley patterns from which I picked a four-foot rim.

After the plate and spindle had been centred and plumbed, the guard was slipped on and strickle set to the outside diameter. A strip was then nailed to the bottom to make the joint or bottom parting, which was simply a flat, level spot sufficiently large to build the mold upon. After getting this in shape the guard and strickle were taken from the spindle.

The pulley rim was now put on the joint and centred from the spindle. The flask which we used was rather large but was all the better for this, considering the depth of the casting and the strain which would be on the mold when poured.

In order to bring the bottom of the flask sufficiently close to the pattern to get a good lift a ring previously used for a loam job was fixed to all four handles of the flask by hook bolts as shown in Fig. 5.

In case a job of this kind should come to a foundry where no such plate was at hand it is an easy matter to strike one off on the floor as shown in Fig. 2 by levelling up two straight edges and striking the sand off level with them and then building up the thickness with a segment.

After ramming up the outside portion of the mold the pulley rim was withdrawn and the guard and strickle replaced and the mold struck up to the proper taper as shown at the left of Fig. 4. From this it will be understood that the portion of the mold which has so far been rammed up is simply a backing to build on to. The face of it has to be roughed with the finger tips or a hard brush and sufficient sand tucked on to it with the fingers to permit of sweeping it to the proper size and shape.

The flask is now lifted off, swung to one side and properly finished and blackened.

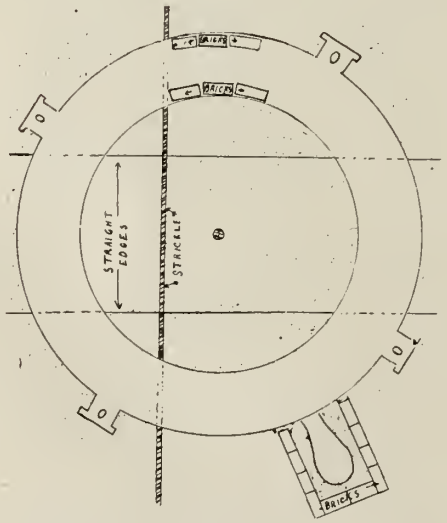


FIG. 2—Open sand mold for lifting plate. The bricks shown are to indicate that it is a loam plate, but are not used in this case.

The pulley rim is now put back on the joint and carefully centred exactly as before. As will be seen in Fig. 1 the pulley has two sets of arms, and the pulley being tapered, one set would be of larger diameter than the other. To overcome this we used arms which fitted the smaller diameter and then had extension pieces (see Fig. 4) for the larger diameter and made the one set do for both places. The core print and hub had to be bored to fit the spindle, and by lifting the spindle out of its seat and slipping the pattern on to it, it was an easy matter to bring the arms to the centre. They were now bedded in the sand at a proper height from the bottom and rammed into position; the parting made at half thickness of arms; parting sand put on and the cast iron lifting plates lowered in between the arms as shown in Fig. 3. These lifting plates should all be cast in one piece with arched connections over the arms for an ordinary pulley with one set of arms, but in a case of this kind it is necessary to make it in sections and bolt them together or else figure on destroying it in order to get it out of the casting. It was now rammed up to the top of the staples, after which the pulley rim was

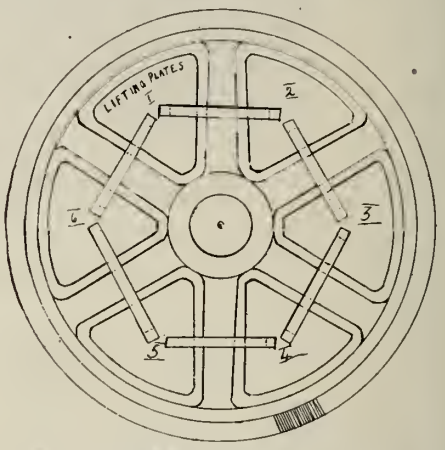


FIG. 3—LIFTING PLATES IN POSITION BETWEEN THE ARMS.

withdrawn, the arms rapped and this portion of the interior hooked to the crane and lifted off. After drawing the pattern for the arms and hub and doing what finishing was required the hub core, which was of the strainer gate type with four gates, was put in place and the portion which was just lifted away was put back in place.

The spindle and the pulley rim were again replaced and the inside carefully rammed up to the next set of arms; the same arm pattern with the extension to

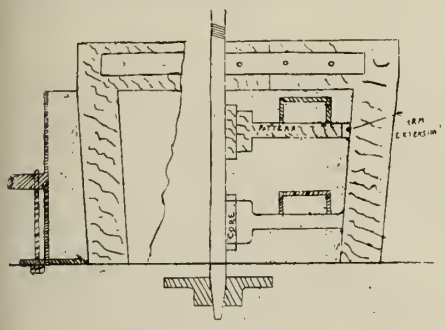


FIG. 4—Left side, shows sweeping taper on cheek, and lifting plate, Fig. 2, secured to trunion. Right side shows lifting plates, Fig. 3, in position, also extension to arm.

the right diameter was rammed up in the same manner as before, the rim withdrawn and the strickle fixed to the spindle and the inside swept to the correct inside diameter. The spindle and strickle were then taken off and the part of the interior which we had just rammed lifted off, the pattern withdrawn and the arms filleted at the corners. After all parts were well finished and rubbed with plumbago, the return of the inside part would now be in order were it not for the fact that its diameter was greater than that of the lower part of the outside, and for that reason the inside piece had to be set to one side until the outside part was closed down, after which the inside was put together. A plug core was now forced down into the spindle hole at the bottom of the hub core to prevent the melted metal from escaping. A flat core was put over the rim to cover enough of it to admit of building the

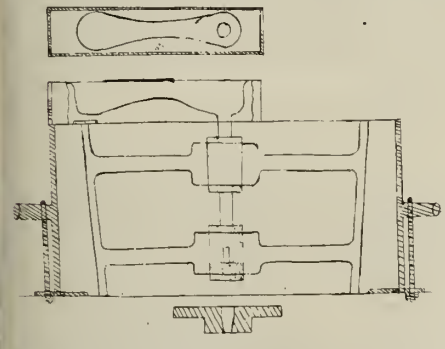


FIG. 5—Mold completed. Note gate in center of hub core. Slot in bottom hub core shows where iron enters mold.

runner basin which connected the outside with the gate in the center core as shown in Fig. 5.

Two rails were placed across with 1,000 pounds of weights on, which held it secure while being poured. A 15 per cent. semi-steel mixture of approximately silicon 1.75, sulphur .8, phosphorus .3, manganese .8 as shown by the analysis of the borings and rim turnings was employed with satisfactory results. The casting was poured at a reasonably high temperature, and the hubs were made bare to prevent the arms from cracking.

Improved and Remodelled Makeshift Cupola

Arranging a Dinkey Cupola Which Was Too Long and Narrow to Daub So That it Could be Daubed

By THOMAS NELSON

IN a previous issue of the Canadian Foundryman we described a makeshift cupola 12 inches diameter and 4 feet high built of odds and ends of material, a cupola which did good service until we strained it beyond its capacity by taking a 280-pound casting out of it.

We decided to rebuild it with some improvements suggested by experience. Before dismantling it we made the necessary castings.

One difficulty we experienced with the original dinkey was getting the inside repaired after a heat owing to its small diameter and the melting zone being too far up to be reached conveniently from the bottom and too far down to be got at from the top. So we decided to split it half way up.

We made a new bottom plate with provision for a hinged bottom. We also made with some sweeps and templates two new elbows for tuyeres, also a new Y piece to replace the tin ones originally used, which had got pretty badly used up with constant use.

To split the dinkey we made a ring plate 14 inches diameter inside 24 inches outside and 1 inch thick with three projecting lugs on the outside edge. Into those lugs we cast a ½-inch wrought iron eyelet.

We also made a rough three armed spider, the arms being long enough to extend over the cupola shell about 4 inches. This also had a strong eyelet cast into the centre.

We picked up a piece of sheet iron 6 feet long 24 inches wide which had been scrapped. This we ran through the bending rolls in the machine shop, and which, after joining the edges together with two rivets, made a casing for the upper half of the dinkey.

Then we had made three hooks to slip over the ends of the three way lifting spider and long enough to take hold of the eyelet in the ring when the spider was placed on top of the cupola. We lined the dinkey in the usual way up to the top of the bottom casing. Then placing on the ring with the sheet iron casing on top, we completed the lining.

Now to lift the top half when we wished to repair the inside.

To the side of the trap door opening up in the roof we fixed two hangers into which we could slip a removable beam with a small sheave pulley attached. The smoke stack was of such light material that we could easily lift it and move it to one side enough to allow of the removable beam being put in place.

We fixed another pulley on to the frame work of the elevator just outside the door, and on a level with the floor of the charging platform, and also a hook on to the platform of the elevator.

We measured the clearance in which we could lift the top section of the dinkey and from that point we also measured with a string the distance up over the pulley on the removable beam, down over the pulley on the elevator frame to the hook on the elevator platform when at its lowest position and cut a piece of chain to the desired length as given by the string.

Now when we wished to lift the top of the cupola we first placed the arm on top, slipped on the three hooks, and took hold of the eyelets in the ring.

Then we put the chain over the pulleys, hooked one end to the lifting arm and the other end to the hook on the elevator platform, which we had raised high enough to reach the end of the chain.

Then lowering the platform to the ground, the top section went up enough to allow the cupola tender to get underneath and do any repairs required in place and daub around the ring was the work of but a few minutes.

The whole outfit was a decided success, but was not much used after getting it going, as business began to pick up at that time and the regular cupola was again brought into service.

The dinkey was rather a novelty and was interesting as showing what could be done in an emergency and with very little expense.

A Calumny

The lady next door says she supposes Lithuania is the place the lithographs come from.—Dallas Journal.

A Large Contract

Early Morning Caller: "Dunn & Grabbit have commissioned me to collect their little account."

Stoney-Broke: "Then I congratulate you on getting a permanent job!"—The Passing Show (London).

The Molding and Casting of a Bronze Runner

By Having a Suitable Lifting Plate on Which to Assemble the Cores They Are Accurately Placed and Bound Together Before Being Put in the Mold

By WM. G. LEISHMAN

IN the foundry where I am at present employed, the Western Foundry, San Francisco, we have cast a number of runners for water-wheels, and as they are very interesting and somewhat intricate articles to make, it appeared to me that it might be of interest to the readers of Canadian Foundryman if the method of making these castings was described, so this article, "The molding and casting of a bronze runner," is the result of this thought.

The runner is for a hydro-electric generator, 22,500 h.p. vertical shaft turbine, to work under a head of 800 feet, and running at 600 revolutions per minute. These water-wheels are being manufactured at the works of the Pelton Water Wheel Co., of San Francisco. The runner is six feet in diameter, has sixteen vanes, weighs approximately 7,600 pounds and is cast of bronze.

It is not the size, nor yet the weight, that is remarkable, although a bronze casting of this size and weight is not an everyday occurrence, but it is the making and assembling of the cores that I will dwell upon.

This article being for molders and coremakers, we will pass by the making of the pattern and core boxes, although it must be admitted that the accuracy shown by the pattern-maker is wonderful, as in no instance has a core been filed or anything done to fit them, they going together without the least trouble.

The molder, of course, has to be recognized, as a great deal of care has to be observed at all stages of the game in molding, setting the core and successfully pouring the metal, but as I have already pointed out it is the core work which really counts on a job of this kind.

By looking at the illustrations, Figs. 3 and 4, which show two views of the casting, it will be seen that the molding would not be particularly difficult were it not for the peculiar shape of the cores. By observing both views it will be seen that the vanes were all cast in the bottom half of the mold while the hub was in the top and fastened to the back of the vanes by means of the ribs shown in Fig. 3. From this it will be understood that the bottom of the hub core when placed in the mold will be almost in line with the top of the vane cores.

THE information contained in this story should be of interest to the brass foundryman and the core-maker, but will be of equal interest to the iron foundryman, since it embodies the same principles which are followed in every type of foundry. Any intelligent foundryman can devise means of melting the metal and also the composition of the cores. These will depend on the facilities at his disposal. The other points are pretty well described and illustrated and there is no reason why any molder, after reading this through, could not follow it in actual practice and produce a first-class water-wheel runner.—EDITOR.

The pattern, it might be explained, is a plain solid block as far as the bottom half is concerned, but the top part is as shown in the casting, Fig. 3. The bottom an iron ring bored to fit the bottom print to guide the vane cores, and before ramming the bottom part into the mold an iron ring bored to fit the bottom print is put in place around the print and tight against the pattern. This ring is rammed into the mold and remains there. Before ramming the cope, the pattern is used as a core box and a core made and baked. This core is put back in the pattern and rammed up as part of the mold and secured to the bars of the cope. The rest of the molding is straight ahead work which it is not necessary to describe in detail.

Now For the Cores

In the making of the vane cores, after the core is rammed up and part of the core box taken away, great care must be exercised in packing sand in the box back of the core in order to level it up so as to bed on the plate, as the core is of such a twisted shape and this exact shape must be preserved. This can be very materially helped by building bricks in with the backing up sand so as to make a good substantial bearing on which to roll the core, thus preventing

FIG. 1—VANE CORES BEING ASSEMBLED ON LIFTING PLATE. NOTE CORE-BOX AND IN REAR TOGETHER WITH HUB CORE WHICH CONTAINS GATE.

FIG. 2—VANE CORES ASSEMBLED AND SUSPENDED FROM CRANE. NOTE LIFTING PLATE ON BOTTOM, AND BAND AROUND OUTSIDE.

any possibility of it springing out of shape.

These cores must be very carefully vented as the surface is great and almost entirely surrounded with molten metal, and the gas must come off quickly.

Assembling the Cores

After the cores are made, the next step is the assembling of them on a plate the exact size of the bottom print, and incidentally the exact size of the ring which we have described as having been rammed into the mold and fitting around the print. This plate is also used for a lifting plate when the cores are ready to be put into the mold.

By observing Fig. 1 a ring or bushing will be seen in the center. This bushing is fitted into a groove in the lifting plate and is exactly centered. The vane cores are placed close up against this, by which means extreme accuracy is obtained.

By again referring to Fig. 1, it will be seen that eleven of the vane cores are in place. This was a simple enough process as they were just put there one at a time. The remaining five cannot be placed in this manner, but must be set further back and then all advanced at once, very carefully and slowly, as the peculiar shape of the cores makes it impossible to do otherwise with them.

By looking once more at Fig. 1, the large foundation plate on which everything rests is prepared by sweeping a smooth and level bed of loam and then drying same in oven. The wooden studs which are visible are cut with great nicety with regard to depth, as they hold the outer end of the core at exact height. They are left in place till the core is dried.

After all the vane cores are set in position on the lifting plate a band is put around the outside of them and pulled up tight by means of a bolt through lugs on the ends of the band. This will be better understood by looking at Fig. 2. At this stage the joints of the cores are filled up, blacked, and put in the oven till thoroughly dry.

Setting the Vane Cores

When ready to set the vane cores the crane slings are attached to the lifting plate and the entire lot is lifted, leaving the foundation plate and the wooden studs behind.

Fig. 2 shows cores all ready to be lowered into the mold—the lifting plate also serves as a print for the same and fits snug into the iron ring plate which was rammed into the drag, thereby making a perfect fit and holding the cores in exactly the proper position.

After the vane cores are placed in the mold and the slings unhooked, the iron bushing in the middle is rammed full of sand and struck off level with the groove or shoulder shown near the top edge of it. This groove acts as a print for the center core.

In the rear of the vane cores in the illustration, Fig. 1, will be seen the center core with disc bottom to fit the print and with four gates just above the bottom. The pouring gate is in the center of this core and the metal flows in four directions simultaneously when poured.

The core boxes in which the vane cores were made are seen beside the center core, and one of the vane cores is also shown leaning against the core box, which will give the reader an idea of what a twisted looking affair it is, and he can form some idea of how this runner is constructed.

Fig. 3 shows the finished casting ready for the machine shop. This is the cope side of the casting and shows internal flange, which, as we have already pointed out, has been got away with nicely by using pattern for core box and making a dry sand core which has been put back on the pattern, and the cope rammed up on it.

FIG. 3—TOP VIEW OF CASTING.

FIG. 4—BOTTOM VIEW OF CASTING.

Fig. 4 shows the other side of the casting with lower edge of vanes in view.

ARE THEY WORKING IN THEIR OWN INTERESTS?

The British Engineers' Association, Inc., 32 Victoria St., Westminster, London, S. W. 1, have presented us with a 160-page classified directory of its members, which includes almost every line of industry. The book is well worth possessing, and the story which prefaces the contents explains things so thoroughly that any suggestions on our part are unnecessary. Note what it says: "Only by the organized collective efforts of those engaged in it can the engineering industry exercise the powers required to promote and safeguard its vital interests. The day of narrow, selfish individualism has gone forever. Your unit reinforcement of your brother engineers will gain for you a reinforcement of many fold. The activities of the British Engineers' Association in promoting the interests of the engineering industry at home and increasing the flow of orders from overseas cannot fail to benefit all engaged in it. By joining the association you will receive the benefit of valuable individual services and have the honor of sharing with your fellows the burden of service to your combined interest."

This compares very favorably with the motto of the American Foundrymen's Association, the American Society of Mechanical Engineers, the American Malleable Castings Association, Foundry Equipment Manufacturers' Association and various other American institutions who work on the motto that whatever yields the greatest good to the greatest number brings the greatest good to themselves. Now compare these British and American institutions with some that we have in this country.

In a communication which we received from a Canadian concern and which contained much which was even worse than the following, we take this paragraph: "In our business the foundry processes are more or less of a secret and we have been able to accomplish some things that other foundries have not been able to accomplish and we do not want them to be made public."

Now why in the name of common sense would anybody get a notion like that in his head? As a matter of fact they had nothing but what is well known the world over, but supposing they had, why would they keep it a secret; why not pass it along like the British and Americans do?

The day of narrow, selfish individualism has gone forever, and this must be recognized in Canada as well as elsewhere. Canadian manufacturers should hunt down fellows who hold such views as are contained in the above epistle and see if something cannot be done with them. Canada is just coming into prominence and we cannot afford to harbor any such notions as these.

Making Big Castings in a Canadian Foundry

Showing Castings for Large Electric Machinery Which Are Simple Enough to Make, Once the Method is Understood

By F. H. BELL

IN the February issue of Canadian Foundryman we showed the mold partly made for a dynamo base which should weigh 45 tons. As a matter of fact it weighed over 47 tons on account of thickening up certain portions which were considered too light on the original plan.

One of these bases was poured at the Allis-Chalmers foundry on February 25 and turned out to be a first-class casting. This casting was lifted out of the mold, causing very little damage to the latter, and another similar casting will be poured into the same mold, thereby saving about three weeks labor in building the brickwork. The spindle and sweep have to be replaced, and the loam work repaired and reswept, black washed and dried; the drying being a very small matter now that the brick work is thoroughly dried through.

FIG. 1—MOLD FOR 47-TON DYNAMO BASE, WITH SOME OF THE CORES IN PLACE, AND COVER PLATE BOLTED DOWN.

In the illustration, Fig. 1, will be seen the mold shown in the former article but considerably further advanced. In this one most of the cores are in place and three parts of the cover is bolted down. In fact the mold is practically completed with the exception of setting the few remaining cores and putting on the remaining portion of the cover plate.

As will be seen, it is deep enough for a man to stand on the bottom and have his head about level with the top. Its design is not such as would present any very great obstacles in the way of the molder, but anyone who has had experience with holding down cores will see that there is considerable core work on this job.

In the illustration, Fig. 2, will be seen how the mold and cores appear from a cross section view. On the outer side of the mold will be seen a perpendicular portion while the inner side is irregular. Directly above the perpendicular section will be seen some small round holes in the cover plate. Twenty-eight of these holes are distributed around the mold, and all being connected by a circular basin make twenty-eight pop gates which all take the iron at the same time. Two pouring basins on opposite sides of the mold connect with the circular basin.

A thirty-five ton ladle and a twenty ton ladle were required to pour this casting; the runner and risers taking up the extra metal. Two minutes and forty seconds were required to fill the mold after the signal was given to begin pouring.

Pretty Good Size

While this is not a complicated piece it is interesting to note that it is about 82 feet in circumference. When in use this casting will be placed with the reverse side up to what it is when cast, and on top of this will be the spider which is a more important part of the machine and a more difficult casting to make. In a future issue I hope to illustrate and describe the molding and casting of this spider.

In the present issue I have been privileged to show another piece which is to form a part of this same machine. This piece is called a bracket, and, looking at the picture of the casting, a molder of average intelligence would consider it a simple enough piece to make. Perhaps it is, but if followed carefully, it will be seen to call for some interesting work on the part of the molder. In molding this piece no brick or loam work was really necessary, but this is the class of work that can be done in brick and loam for less money than by any other method. Smaller ones of the same design were made in skin dried sand molds, but these could have been molded from a pattern if such had been at the disposal of the molders, but for one of the size shown in the illustration there is nothing quite so good as the loam mold.

Molding a Bracket

The casting shown in Fig. 3, as we have said, is known as a bracket. Several of these were required and by making the mold of brick the same mold answered for the entire lot. When I say mold I simply mean the bottom for the mold and a portion of the top, as most of the casting is made in cores. The bottom could have been made in cores also, but this would have been additional expense. If a flat bottom of green sand had been swept off on the floor and flat bottomed cores used, the casting could have been produced but a much bigger core would have been required which means a waste of time, material and heat for drying. It also means that the

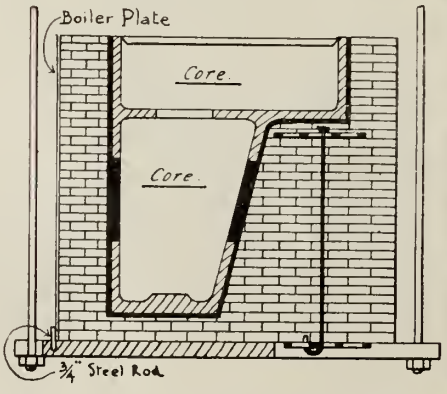


FIG. 2—CROSS SECTION VIEW OF CASTING BEDDED IN THE BRICK AND LOAM MOLD. ALSO CORES SET AND COVER PLATE IN PLACE.

FIG. 3—VIEW OF SPIDER CASTING AS TAKEN FROM THE MOLD, AFTER BREAKING OFF THE CORES WHICH SEPARATE THE ARMS.

FIG. 4—VIEW OF MOLD FOR SAME. WOULD NOT IMPRESS ONE AS SUCH ON FIRST SIGHT, BUT FIG. 5 WILL SHOW IT MORE CLEARLY.

accuracy of the casting depends on the accuracy of the outside of the core. In the mold here described the bottom is swept out as shown in Fig. 4, after which the cores for the legs are placed as shown in Fig. 5. These cores as will be seen in Fig. 5 are made in parts and built up to make the legs. One will be seen completed while two others are partly done. On the flat sides of the ones which are partly done will be seen the impression of one half of the leg. When all the cores are completed the entire eight legs will be provided for. If the two partly finished cores shown in Fig. 5 were completed it will be seen that the three cores would fit tight together at the part where the cores show a portion cut away on an angle. If all the cores were in place they would, of course, all fit tight, thus forming the flange or web which surrounds the hub, and which incidentally continues along the entire casting, and also forming the entire hub with the exception of the top. On the inner ends of the leg cores will be seen an offset or shoulder which constitutes a guide for centering the cover for the hub.

In Fig. 6 will be seen the cover for the hub. This is intentionally shown out of proportion, being much larger than would appear to fit in the space reserved for it, but it gives the reader a better opportunity to see its details. It will be seen to be pierced in two places for gates. This cover would appear to be a core, which in reality it is, but it is made of brick and loam. The bricks are securely fastened into a cast iron grid and the loam is plastered on to the bricks and swept to shape, the eight ribs being the only parts which are made from patterns. The rib patterns are put in the proper position by using the sweep for a guide before putting the final amount of loam on to the bricks. After being finished and blackwashed, it is thoroughly dried. This cover fits neatly into the place allowed at the ends of the leg cores, thus completely enclosing the mold.

The spaces between the leg cores are now rammed full of molding sand; a runner basin is built connecting the two pop gates at the hub with the pouring basin at the outside extremity of the mold for convenience in pouring. The mold is now ready to pour, with the exception of weighting and binding to the anchor irons in the floor.

This casting, Fig. 3, is 14 feet in diameter and weighs 26,000 pounds. It forms part of the interior mechanism of the dynamo, and while it is no comparison to the casting made in the mold, Figs. 1 and 2, it nevertheless represents a nice line of molding. A molder viewing the casting after being finished would probably picture a cope of some kind covering the entire mold, and cores forming the spaces between the legs, but he would hardly imagine these same cores forming the entire mold with the exception of a small portion on top of the hub, and the under side of the legs.

In looking over the illustrations some familiar foundry scenes are in evidence. In Fig. 4, to the right of the mold will be seen the remaining cover plate for the mold, Fig. 1. In the same view will be seen the spouts of the three cupolas which supply the melted iron for the ponderous castings. The coke baskets for drying the deep molds are also shown in this view. These baskets are made by cutting a mold for the frame in the foundry floor, and after standing the iron rods in it, the melted metal is poured around them.

In Fig. 3 will be seen the pipes leading from the heating and ventilating system. As will be seen they point in two directions, one towards the molders and the other towards the core makers. The heating system is located on the staging on a level with the charging floor. It consists of a blower connected to a steam coil system. The fresh air from out-of-doors passes through the hot chamber and is forced through these pipes into the foundry.

FIG. 5—CORES PARTLY PLACED FOR AN ARM OF SPIDER.

FIG. 6—COVER FOR HUB. INTENTIONAL SHOWN LARGE IN ORDER TO BRING OUT DETAILS.

Where the Speed Is

When it comes to automobile parties, a machine is only as fast as the people in it.—The Sun-Dial.

PATTERNS AND CASTINGS

By W. P. ESSEX

IN these columns from time to time, as opportunity and circumstances will permit, the writer will endeavor to present to the readers of this journal, in a form as simple and concise as possible, a series of papers dealing with his experiences and observations in the pattern shop and foundry, together with hints and suggestions along these lines, trusting that at some time some one of them may prove helpful in a practical way to those who are interested in the different departments and operations which are necessary in making foundry production possible.

These experiences and practices have been obtained in many different shops and cover many years of actual work in the pattern shop and foundry and they will touch upon a wide range of subjects dealing with the history, source, properties and treatment of the many and various materials used in the foundry and pattern shop, and in which those who are engaged in the different departments, it is hoped, will find something perhaps interesting and instructive and having a close relationship and bearing on the working of those materials which enter into the production of patterns and castings.

The writer does not claim to be an expert in foundry matters or to possess superior knowledge in advance of present methods employed in the every day practice of the average pattern shop and foundry, and no claim as to originality for many of the methods and practices which may be described in these articles is made. They have been gleaned from many various sources in the writer's time and experiences, and while many of these methods and suggestions may not be new to many foundrymen and patternmakers, for it seems hardly possible to write on shop subjects without treading on some ground that has been travelled on before, but there are some, it is hoped, to whom these suggestions and experiences may prove helpful.

These experiences have been mostly obtained in what would be called small foundries, employing from five to fifty moulders and producing castings classed as "light to medium heavy," which range from lock work to the smaller types of steam and gas engines, but many of the methods employed even in the smallest of some of these foundries would do credit to many of the larger and more pretentious shops where engineers and mechanical experts are employed to improve methods and devise systems for the bettering of the product and increasing the output of the works, and here as in the smaller shop there is always room for improvement.

In the small shop, lacking room, tools and equipment, there are occasions when some necessity arises and difficulties are encountered which tax the resources of the shop and small staff to accomplish the result demanded. Some one with

W. P. ESSEX.

ideas and initiative suggests a way of getting over the difficulty; the idea which is put into practice is perhaps an original method, which, successful or otherwise, is worth remembering, and if practical the experience should be put on record and passed along to help others.

The Small Shop Is Sometimes a Great School

The keeping of a note book handy in which to jot down an idea or wrinkle which is worth remembering is a practice which cannot be too strongly urged upon every young mechanic. That the writer has neglected to do this is one of his regrets, as much of the material here used will of necessity have to be drawn from memory, and that faculty, like an old roof, has become somewhat leaky and it is only after the many requests made by an old shop friend, the editor of this journal, that he has at last consented to dig up material for these papers.

The Note Book

The note book habit along with the reading of a good trade journal like the Canadian Foundryman, or some other of the many excellent mechanical magazines that are now available, is a practice which should be followed, not only by the mechanic and the apprentice in the shop, but those also whose office it is to direct the policy and works organization, for at some time or another the necessity may arise when the availability of that data to draw from and try out in practice may prove exceedingly profitable and amply repay for the little time spent recording it. And further it is recommended that not only the stunts and wrinkles observed in and about the works be jotted down in the note book but also those methods and formulae which from time to time come under the reader's notice in the pages of his trade journal or in some technical work and which have a special interest for him, or some particular reference or relation to the occupation which he follows. It is unnecessary to rewrite the article, a sketch or brief outline, with the subject, the name of the book or paper, with the page number and the date is sufficient, this will serve as an index for future reference and from it the original article can be referred to at any time, providing, of course, that the copies of the journal are preserved, as they should be, when possible, and the book at any time be available.

Observations on Readers

Some modern shops are provided with reading rooms and libraries for the employees, the management possibly being under the impression that the well-informed man is the best workman. This may or may not be the case, but there is no doubt that the most intelligent workman is always a reader.

Readers and students of any science or craft are interested in different ways and their tastes vary considerably in the selection of reading matter. There is the mechanic who is both studious and practical and studies the technic of his trade through the medium of books and technical magazines. He is always on the lookout for newer practices and shorter methods of getting results and is eager to put into practice any new suggestion that comes under his notice. Then there is the quiet, unassuming mechanic, methodical in his work and perfectly dependable, a thoughtful, studious reader of mechanical works both practical and technical, but seldom does he

apply that learning gleaned from books to his work in the shop, even when the opportunity presents itself to test out some method of which he has read. It may be possible that in the thoroughness of his mechanical training that none of the methods that he meets with in the course of his reading justifies him in deviating from the practice which he has always been accustomed to follow.

Again there are those who in their reading select those articles which are the most easily assimilated, the complex and highly technical written articles do not appeal to them, for the reason, perhaps, that it is too much like study and does not afford them the variety, or that measure of mental recreation, which to them is most desirable in reading. They read for the pleasure that they derive from it and from a desire to broaden their knowledge in all matters relating to their craft, as well as in those subjects which have a mechanical relationship, even if distant, to the work followed in their daily occupation. To this latter class does the writer respectfully submit his efforts.

There are still a few others yet to mention before our classification of readers is complete. They are the indifferent readers, the casual readers, and the workman who only reads the daily paper and the "yellow sensation" which he takes home on the Saturday night for his Sunday reading.

Likes Technical Papers

And just in passing, this suggestion is dropped, that those readers who have the proof in themselves that the value of the technical knowledge that can be derived from the reading of trade papers is both sound and material should get busy and do some missionary work among those of the latter class. This leads us into another phase of the reading subject, which the writer has not touched upon, that is, of the benefits to be derived from the reading and study of mechanical papers and shop literature, but this subject is well thought out and expressed in an editorial entitled "The Value of a Technical Paper" in the March number of the Canadian Foundryman.

The Canadian mechanic, as a rule, is not lacking in initiative nor is he hedged about with old-time conventions, which make it difficult for him to break away from time honored customs and practices. He does not reply when asked why he does that job a certain way, "That's how I learned to do it when I served my time." He has a reason, and it is just that reason and others that many of us would like to know. The ideas and methods of individuals differ and in the exchange of those ideas there is something to be learned, something which may be materially helpful to some other fellow engaged in a similar line of work, and there is no better medium than the columns of the trade journal for doing it.

Table of Chords and Laying Out a Hexagon

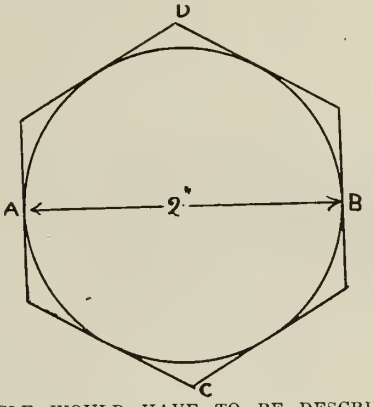
Two Small Contributions Which Will Be Of Value to Pattern Makers

By J. E. WILLSON

THE two articles which I am here submitting have been of inestimable value to me in my work as a pattern maker. Either one might be figured out by a capable mathematician, but it takes time and there is always risk of mistakes. I trust that you will see fit to publish them as I would like to see them passed along for the benefit of others.

Laying Out a Hexagon

Most pattern makers know what time it takes to lay out a hexagon, especially if it is on the end of a round piece. As



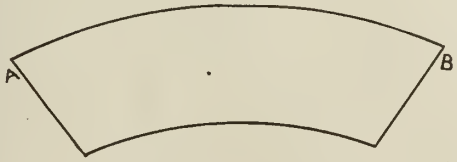
CIRCLE WOULD HAVE TO BE DESCRIBED AT C, D, AND NOT AT A, B, AS SHOWN.

a rule only the distance across the flats a b Fig. 2 is given. For instance, the order might call for a hexagon two inches in diameter, meaning, of course, to fit a wrench with a two-inch span. What the pattern maker wants to know is what size or diameter of circle he will have to describe in order to secure the two-inch diameter across the flats as shown at a b, or in other words he wants to know the diameter from C to D.

Now to find that distance without laying out the work just multiply the distance across the flats by 1.156, which will give the distance C—D.

TABLE OF CHORDS

This will be found to be a very convenient table for ascertaining the length of the chords of segments of circles, or



SEGMENT OF CIRCLE

the length of core boxes for cover cores, or rim cores for band and fly wheel rims, or any large circular piece that is built up in segments.

The first column gives the number of segments that may be desired to obtain the length of the chord. The radius of the circle is multiplied by the decimal given in the fourth column.

The degrees and minutes are also given but they are seldom needed by the average pattern maker. This table should be cut out and mounted on heavy cardboard and kept in a convenient place for everyday use and it will prove valuable, especially to our younger generation of pattern makers.

TABLE OF CHORDS OF SEGMENTS

Number	Degrees	Minutes	Decimal
3	120	..	1.732
4	90	..	1.414
5	72	..	1.175
6	60	..	1.000
7	51	25	.867
8	45	..	.765
9	40	..	.684
10	36	..	.618
11	32	43	.563
12	30	..	.517
13	27	41	.478
14	25	43	.445
15	24	..	.415
16	22	30	.390
17	21	10	.367
18	20	..	.347
19	18	57	.329
20	18	..	.312
21	17	8	.298
22	16	22	.284
23	15	39	.272
24	15	..	.261
25	14	24	.250
26	13	51	.241
27	13	20	.232
28	12	51	.223
29	12	24	.216
30	12	..	.209
31	11	37	.202
32	11	15	.196
33	10	54	.190
34	10	35	.184
35	10	17	.179
36	10	..	.174
37	9	44	.169
38	9	28	.165
39	9	14	.160
40	9	..	.156

Changing the Call

"They say Edison is working on a machine that will enable us to talk with the departed."

"I suppose the proper call will be Heaven-ho instead of Hell-o!"—Boston Transcript.

Malleable Iron Castings Will Resist Rust

Examples of Malleable Iron Which Have Withstood Some Severe Tests Such as Being Buried for 40 Years, and Being Exposed for Years to the Weather

ONE of the greatest enemies of any iron or steel product is corrosion or rust and much research has been carried on to discover its causes and to provide a protection. The farmer allows his farm machinery to remain out in the field over the winter months, the various elements which enter into the construction of a freight car are subject to all sorts of weather extremes, and the materials used in track work must withstand the results of being imbedded in various kinds of ballast material with the added reactions caused by drippings of brine and other substances from the passing cars.

It would seem, however, that the malleable iron casting has in its very structure the best possible protection against these influences. We know this to be true from actual experiment and from the results obtained in practice. We find, however, that opinions differ as to why it is true. One of the more recently advanced theories we quote as follows:

TYPE OF HEAVY REAR AXLE HOUSING OF MALLEABLE IRON.

The belief that the purer the material, the less subject it will be to corrosion, is not borne out by the facts and has given way in the minds of some to the theory that the structure of the material rather than its chemical composition is the governing element. It is true that a casting when subjected to the weather will almost immediately cover itself with a thin coating of rust, but there the action of the elements seems to stop and even after years of service the weight and other characteristics remain unchanged.

If we refer once more to Fig. 3, we find that malleable cast iron is made up of large numbers of irregularly shaped crystals or granules which are held together by one or more metallic bonds. When exposed to an oxidizing influence the outer crystals are immediately affected, forming a coat of iron oxide or rust over the casting and this coating itself protects the inner crystals from further attack by the oxygen, a resistance which is aided by the irregularity of the crystals and the increasingly strong bond between them.

Any casting has this structure and hence power of resistance, but the power is strengthened in the malleable and the grey iron casting by the presence of free carbon which is found in both but is not found in steel and which furnishes a further barrier against the advance of oxidation. If we now take steel as poured in the original billet and manipulate it by rolling as is done in the manufacture of bars and sheets, we at once tend to modify its crystalline structure. The structure becomes fibrous and finally laminar and the ultimate result is the formation of leaves adhering together but separated by minute particles of slag and scale and the small per cent. of silicon always present in the steel but uncombined with it. This structure when attacked by the oxidizing influence has a tendency to pit and flake off, thus exposing a fresh surface to attack and the action will pass at times entirely through the section.

Fig. 9 is reproduced from a photograph of four tie plates, one being a malleable iron casting and three of steel. The malleable plate which was originally one-sixteenth of an inch thicker than the steel was in service for seven years, while the steel plates on the same length of track had to be removed at the end of five years and were in the condition shown. This would seem to show the action of malleable iron and steel under the same conditions.

Fig. 10 reproduces a malleable iron harness part which was manufactured in the early sixties. It was dug up in 1901 while excavating for an extension of the foundry which originally made it. It had undoubtedly been buried about forty years and for that length of time shows very little corrosion.

This resistance to rust and corrosion is of vast importance to the engineer. It is true that the majority of mechanisms which are designed to be used entirely out of doors are given a protective coating of paint, but it is also true that under the hard usage accorded the railroad car or the agricultural implement, the paint soon disappears. Again in some very important cases such as the rail anchor, the rail brace, and the tie plate, no such protection is received by the casting and the inherent good qualities of malleable iron are depended upon to resist the ravages of time.

We have already mentioned the malleable iron sprocket chain as an example of a casting which must resist physical wear. We may also point out that practically all the manufacturers of freight car draft gears make use of this material. This speaks well for its resistance to shock and fatigue. It might not be amiss to note here that in many cases the failure of other malleable iron castings used in freight car construction has been wrongly laid to this metal. It can be shown that in almost every instance where the malleable casting has been displaced by a steel casting or a forging the design has been modified or the section has been increased, and the fact that many such parts are again being made in malleable iron would seem to show that proper co-operation between the engineer and the foundryman will bring results which are perfectly satisfactory to the former.

The combined capacity of the malleable iron foundries of the United States and Canada is in the neighborhood of a million and a half tons per year. This

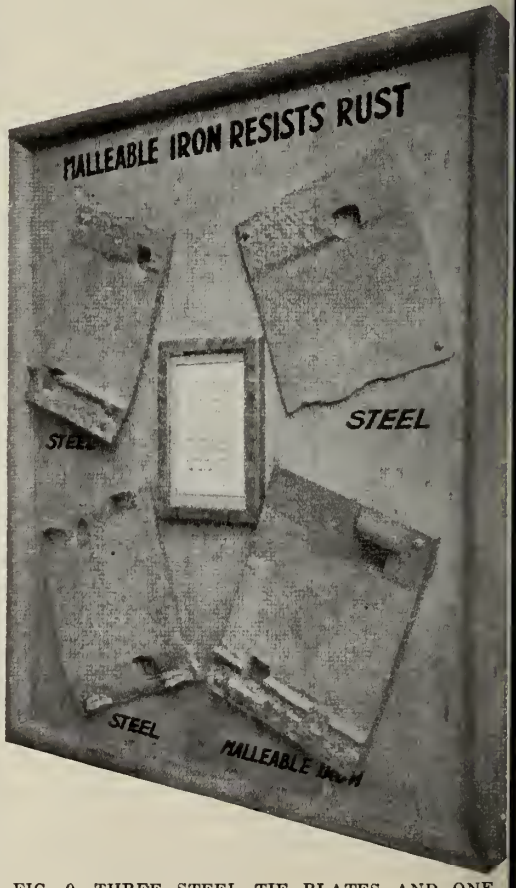


FIG. 9—THREE STEEL TIE PLATES AND ONE OF MALLEABLE IRON.

production is distributed among a large number of companies who, more or less, specialize, each in some particular line of work such as railroad car castings; automobile, agricultural implement or stove parts; valve and pipe fittings, chain and articles for the hardware trade. The consumer can readily find a source of supply especially adapted to the making of the particular class of work he requires and many of the larger plants are equally well able to handle any of the types of work mentioned above.

Malleable iron is more costly—pound for pound—than grey iron, but because of its strength and power to resist shock a much lighter malleable casting may be

FIG. 10—MALLEABLE HARNESS PART BURIED IN THE GROUND FOR FORTY YEARS.

used for a given purpose than would be safe or even possible were the casting of grey iron. Hence the malleable iron casting for a given use is generally cheaper. This in addition to the fact that a great deal of weight is saved explains in a measure why malleable iron has displaced grey iron in many cases of agricultural implement and car construction.

The same reasoning applies generally in a comparison of malleable iron and steel castings. Malleable iron may be poured in lighter sections than steel where weight is a serious drawback and for the same reason it is possible to make castings of malleable iron which the steel foundryman would not attempt.

In appearance the malleable iron casting is as smooth, as clean and as true to pattern as grey iron, while, due partly to its lower pouring temperature and partly to the moulding practice employed in the malleable foundries, its finish is far more attractive and truer to outline than the steel casting. This fact alone is important for it saves machining and permits assembly of parts with, in many cases, no finishing work being done on them. Taking the other physical qualities for granted it is largely because of its clean, smooth appearance and its very slight variation from the pattern that the malleable casting has been demanded in such large tonnages by the automotive industry.

It is especially adapted for use in the construction of the pleasure car, the truck and the tractor because of its strength, its freedom from excessive weight and its ability to withstand snock and vibration. It has for these reasons in many cases displaced the steel casting and the forging in this work. Illustrations of this type of casting are shown.

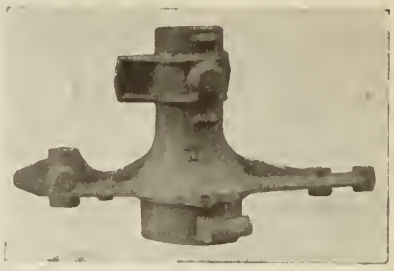
Below is given a summary of certain physical qualities of malleable iron which have been determined and verified by experiment:

*Tensile strength, pounds per square inch	45,000
*Elongation, per cent. in 2 inches	7½
Ultimate fibre stress in cross bending, pounds per square inch	64,000
Young's Modulus, for loads under 25,000 pounds per square inch	29,000,000
Elastic limit, pounds per square inch	33,000
Strength in compression, pounds per square inch	100,000
Specific gravity	7.4
Intensity of magnetization at saturation, C. G. S. units	11,500
Permeability at this density, C. G. S. units	300
Maximum permeability (at about 6,000 lines per square centimeter)	2,000

*Based on A. S. T. M. specifications.

The figures given are conservative and may be safely used in practice by the engineer. However, it will be found much more satisfactory, and any design will generally be more successful, especially in its physical qualities, if the engineer will consult and co-operate with the foundryman before making up his patterns.

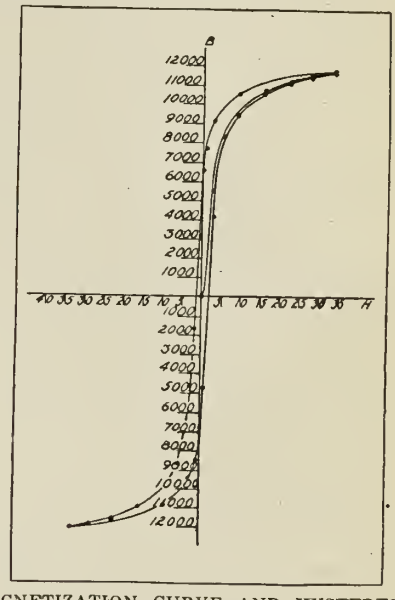
There are many reasons why this is desirable. Malleable iron, as previously indicated, is adapted to a wide range



INTRICATE AUTOMOBILE PART OF MALLEABLE IRON.

of uses but it does not follow that the mixture or analysis best suited to the heavy casting will give the most satisfactory results when poured into light, thin sections. In fact the reverse is true. Again there is a frequently met with tendency on the part of some designers to take undue advantage of the fact that malleable iron may be cast in small sections. Strength is frequently sacrificed for the saving in dollars and cents brought about by cutting down the weight of the casting.

The foundryman should know the purpose for which the casting has been designed and the task which it will be called upon to perform so he will be in



MAGNETIZATION CURVE AND HYSTERESIS LOOP OF MALLEABLE IRON.

a position to determine the proper mixture and to recommend the most economical section. He and his product should not be blamed for failures due to matters in which he has had no voice and to causes over which he has had no control.

In conclusion, wisdom dictates the selection of a reliable and progressive malleable iron manufacturer, since this will insure conscientious attention to every detail of the process and the customer will have confidence in knowing that he will get precisely what has been agreed upon instead of an unreliable and imperfect substitute.

Data on Acid and Basic Electric Furnaces

The Two Different Processes; Each Has its Advantages and Each Should Be Used in Its Proper Field

By F. W. BROOKS

IN view of the number of firms who have asked our company during the last six months to advise them as to whether they should instal acid or basic lined electric furnaces, the following write-up and the reasons that should govern such a decision would probably be of general interest to electric furnace users:

Acid operation should be adopted when:

1. The sulphur in the scrap is and always will be less than the sulphur required in any castings you will be required to make.
2. The phosphorus in the scrap is and always will be less than the phosphorus required in any castings you will be required to make.
3. When the range of carbon and silicon contents will always be wide.
4. When close physical tests have not to be met.
5. When power consumption and rate of operation are of prime importance.
6. When very small castings are the sole output.

Basic operation should be adopted when:

1. The sulphur in the scrap now or in future may go above the limits required for chemical or physical tests or requirements.
2. The phosphorus in the scrap now or in future may go above the limits required for chemical or physical tests or requirements.
3. When the steel has to be made (for chemical or physical reasons) to a close carbon, silicon or manganese analysis.
4. When close or good physical tests have to be met.
5. When alloy steels are ever to be made in the furnace.
6. When steady load is essential.
7. When refining of cast iron is being considered.

Reasons 1 and 2 Acid and Basic

A prospective purchaser of an electric furnace in looking over his available scrap supply often feels he can obtain all the scrap he requires of a sulphur and phosphorus content low enough (say below .04 per cent. sulphur and phosphorus) to meet his requirements. The scrap market and the freight situation, it has been our experience, only too often upset his calculations and he is confronted with the problem of having a high sulphur and phosphorus scrap and a furnace which cannot eliminate these all-important injurious elements. It has often meant one of three things: (a) paying an excessive price for low sulphur and phosphorus scrap, (b) a shut-down until proper scrap can be obtained, or (c) bad castings and a dissatisfied customer.

Let us assume that the above situation can be satisfactorily met. There is still the subject of requiring a low sulphur for special occasions, as for instance the making of a specially difficult casting where the foundry has its own particular difficulties and where a low sulphur steel would be of particular value in helping out the foundry. This can only be done in basic furnace.

Reasons 3 and 4 Acid and Basic

It is much easier to control the carbon, silicon and manganese in the basic furnace, which means that where specifications have to be met the rejections are much less, particularly on physical tests, such as good relation between the maximum stress and yield point, and a good elongation with a relatively high maximum stress. This is because of the inherent value of an electric furnace for making refined steels of a quality better than the converter steel, the open hearth steel and at least equal to crucible quality, which is only present in the basic operation.

In contemplating the installation of an electric furnace it should be borne in mind that the lining of the furnace has a marked effect on the chemical analysis of the resultant metal and for this reason a silica fire brick might suit in some places while a magnesite brick would suit in another. In order to enlighten those who are not acquainted with the subject we publish the following paper from Mr. F. W. Brooks, vice-president of the Electric Furnace Construction Co. of Philadelphia.—Editor.

Refining can be done in the acid furnace to a limited extent, but calls for skilful operation and is not reliable.

Reason 5 Acid

The acid operation gives a better power consumption in the relation of about 100 to 112, because there is practically no refining in the acid operation. It also gives a less refractory cost, as the cost of raw material is less and the repairs are less frequent.

Reason 5 Basic

If alloy steels are ever contemplated, a basic furnace is required. Manganese steels, for instance, so often required in the steel foundry industry, can only be economically made in the basic furnace. The use of other elements, particularly chromium, vanadium, etc., can only b handled in the basic furnace, and whil the making of alloy steel castings ma not be of immediate consideration, thei use is becoming more general every da especially for parts requiring uniform wearing qualities, resistance to shoc and resistance to alternating stresses.

Reason 6 Basic

A basic furnace invariably has steadier load than an acid furnace, fo two reasons:

(a) Higher secondary voltages ar used in the acid to bring about mor rapid melting.

(b) The resistance of an acid slag higher than the resistance of a basi slag, and therefore also requires higher voltage.

Both of these calling for a higher se ondary voltage causes in practice long arcs and higher surges because the ele trode travel cannot pick up as rapidly.

Reason 6 Acid

In making all small steel casting three important points must be kept i view:

(a) Do not have the furnace of t large a capacity—instal smaller uni and more of them; for instance, wh the castings do not exceed 10 to 1 pounds a 1-ton furnace should be th maximum.

(b) "Hot" metal is essential, becau of the necessity of pouring into shan ladles where the transfer losses and th ladle losses are high and because of th number of "pours" required.

(c) It must be easy to hold back th slag and acid slag will keep back an separate more readily than basic slag.

This does not mean that small cas ings cannot be made in the basic furnac but means that in foundries where cas ings weighing ounces and a maximu of say 25 pounds are to be made the ac operation is easier and more economic providing, of course, that the oth clauses can be met satisfactorily.

Reason 7 Basic

Probably the latest field which is ma ing rapid strides for the electric furna in the foundry is for the refining of ca iron. This is particularly applicable the making of engine cylinders, hi presure valves, piston rings and par requiring uniform wearing qualities, et and the practice now being adopted is pass the molten pig-iron from the cupo through the electric furnace for a refi ing period of 20 to 40 minutes, whi gives:

(a) a rapid desulphurization.
(b) elimination of occluded gases.

Continued on page 31

Oxy-Acetylene; Its Usefulness in the Foundry

Its Heating Power Compared With Other Flames—Its Chemical Content and Its General Adaptability to the Work in the Foundry

As acetylene produces about five times more heat per cubic foot than hydrogen, and nearly doubles it in intensity, a marvellously powerful flame is condensed into very small volume. Compared to the oxy-hydrogen flame, it is like comparing a finely pointed tool to a blunt instrument. With such a flame having heating power from two to three times that required to melt the commercial metals, almost incredible results are obtained. The effect of this tremendous heat at the point of treatment is to bring the metal very rapidly to a molten state so that it flows together or "fuses" into one piece. A special filling material is used to fill the gap caused by a fracture, or between pieces of new metal being welded together. This material is of such quality and texture that in many cases the welded part is stronger than the original metal. Thus it will be seen that the oxy-acetylene welding does not merely cement two pieces of metal together as in soldering, but it "fuses" them into one piece.

A great future application in the oxy-acetylene welding art is in the development and use of automatic machines. With full realization of this fact several manufacturers are advancing rapidly along this line. Welding machines are being built for various purposes. On work to which they are adapted they are much more economical than hand work, because the welding is performed at the uniform predetermined speed which has been ascertained as most efficient, reducing time and the consumption of gases and making better and smoother welds. Cutting machines are also being developed and have proved of great value in manufacturing work.

Chemistry of Process

The chemistry of the process, briefly, is as follows: Acetylene (C_2H_2) is composed of carbon (C) and hydrogen (H). When acetylene burns with oxygen (O) at the tip of the blowpipe, only with the carbon in the acetylene assists in the burning, forming carbon dioxide (CO_2). The temperature of the flame at the tip caused by the combustion of the carbon with oxygen is so high that it is impossible for water in the form of steam to exist. (Steam dissociates between 2,000° and 4,000° F.) The oxygen, which would combine with the hydrogen and form water if the temperature were sufficiently low, assists in the combustion of the carbon of the acetylene. The hydrogen passes away and does not combine with the oxygen of the air until it has left the high temperature zone of the welding flame.

A characteristic of the oxy-acetylene flame is that it indicates the correct mixture, for when the acetylene is in excess a small green cap appears over the inner cone of the flame. On reducing the oxygen there is a point at which the cap disappears. The mixture is just right at this point, and the effect is so distinct that when working with acetylene the workman has no excuse for not getting the right proportion. If temperature were the only consideration the oxy-acetylene process would be used in all cases in the working of thin metal, but its use requires much greater skill than the lower heat of the oxy-hydrogen flame. Then again, when a fixed acetylene generator is not available, the danger of a portable generator is considerable, and in such cases for oxy-acetylene welding "dissolved" acetylene only should be used if the work is to be done by average mechanics who might be inclined to neglect the generator and not take the precautions that are necessary when the acetylene gas is generated on the spot.

THAT oxy-acetylene cutting and welding is among the most useful of modern improvements in foundry practice is an undoubted fact and that the foundry is one of the places where it has an opportunity to display its usefulness to the best advantage is equally as true. That it has many other uses is not doubted, but this should not detract from its value as a feature in foundry work. That a manufacturer will have a complete equipment installed in the machine shop and then be so short sighted as to still resort to the time honored method of burning on defective parts of castings in the foundry with melted iron poured from a crane ladle is inexcusable, but such is frequently the case. Illustrations of this kind will be published in the next issue of this paper, together with proper method of procedure.—Editor.

Process Very Useful

By this process, cast iron, steel, aluminum, brass, copper, platinum and other metals may be so perfectly united as to defy detection when the joint is smoothed. Its uses include the following: Reclaiming light and heavy castings coming from the sand with blow holes, sand holes, cold shuts and lugs off; reclaiming light or heavy cracked or broken aluminum castings; adding metal to parts subjected to friction; repairing large or small frame members in place, welding split piping or flanges on pipes; reclaiming imperfect steel castings; extending short shafting, adding small metal parts broken off or missing and renewing teeth broken from gear wheels. This process is of inestimable benefit to the automobile repairman, and every foundryman who owns an automobile or intends to have this line of work included in his work should have experience in handling the welding torch. In fact its uses in the automobile or machinery repair shop are legion, but this is getting afield from the foundry proper, although the automobile business is frequently found affiliated with the foundry.

Use of the Cutting Torch

The operation of cutting steel or iron with the oxy-acetylene torch is very simple, but is, at the same time, quite different from that of welding. Like the Bessemer process of converting cast iron into steel, by utilizing the carbon contained in the iron as fuel to heat the iron with, the cutting torch simply requires the acetylene until the metal becomes red hot, after which the acetylene is discontinued and a jet of pure oxygen turned on, which unites with the carbon of the metal and produces rapid combustion or burning and disintegrates it with surprising rapidity. In our next lesson this will be described in detail.

DATA ON ACID AND BASIC ELECTRIC FURNACES.

Continued from page 30

(c) an accurate pouring temperature.

These causes will speak for themselves to the progressive foundryman, who in the past on particular work had gone through periods of worry in this: Sulphur in the coke, blowholes, and "hot" metal and "cold" metal.

Only the basic furnace can be considered for this purpose.

In looking over the number of furnaces recently installed in foundries, it must be surprising to the prospective buyer to find the large percentage of acid installations. This should not be taken as a criterion. These furnaces were only too often installed by foundries that used electricity as a "fuel" and the electric furnace as the melting pot, thereby hurting the electric steel field. They sold their product during a time when there was a loud cry for steel castings and when inspection was either entirely missing or at least lenient. The sulphur and phosphorus specifications were eased off and physical requirements were seldom met. This does not mean that the acid furnace had not its own field, as there are many cases where the correct "business" decision should be for the acid furnace, but this decision should be reached after a careful study of all the existing conditions and as many of the future conditions as possible.

Treat *Machines* Better than the *Men*?

Well, Perhaps They Didn't Mean It To Work Out That Way, But the Foundry of To-day Filled With Moulding Machines is Brighter Than the Old One Filled With Men

By F. H. BELL
Editor "Canadian Foundryman"

From. Dec. Convention Number Canadian Machinery.

A TYPICAL MODERN FOUNDRY BUILDING. ABUNDANCE OF LIGHT, HEAT AND VENTILATION.

COULD there be anything more interesting or fascinating than the moulding and founding of metal? To see the agile artisan plying his tiny tools and his dexterous fingers in the skilful preparation of the moulds, and to see this same artisan and his nimble fingers converted as though by magic into a giant of herculean strength with brawny arms conveying the ponderous ladles of molten metal, boiling and seething from the melting furnace, to be poured into the moulds which he had just completed a few short moments before? To see the honest sweat streaming from his brow as he tears the moulds asunder, and exposes to view the red hot castings, true to every detail, and to note his beaming countenance as he gazes with well-deserved pride upon his handiwork?

Truly, it is a magnificent sight.

Yes, the programme of the moulder is wonderful, but for those of us who have spent our days within the gloomy precincts of the moulding shop as a means of keeping soul and body together, much of the grandeur and magnificence has been overlooked, or perhaps the fascination and the interesting features in connection with the moulders' noble art did not present themselves to us with the same degree of prominence as did some of the other more notable characteristics of this most necessary institution—the foundation of all mechanical achievements—the foundry.

The Surroundings Were Dingy

But they were there just the same, hidden away behind a sand heap or buried beneath a pile of debris, and while our eyes were bleared with core smoke and our brains befogged with foul gas and dust, we allowed the fascination of the surroundings to go unnoticed.

It is all right for the uninitiated foundryman who has received his foundry experience at the office desk to say that we take the wrong attitude, which perhaps we do, but under conditions as they existed there was no other attitude which a person could take.

But with all its shortcomings, the foundry, with its various features, is one of the most interesting of callings and one which bids fair to hold a more prominent place in the manufacturing world than it has done since the days of Tubal Cain.

Improvements Have Come

If the moulder, who perforce sees nothing but the dismal features, cannot become interested enough to suggest improvements, it behooves the employer to do so, but up to a comparatively recent date moulders have been so plentiful and apprentices so eager that no thought of change was ever considered, and if Tubal Cain could have come back to earth forty years ago and could have visited the average foundry he would have identified most of the equipment as his invention and would no doubt have been able to point out improvements which he had devised and which had since been forgotten.

With modern improvements in other lines of occupation and with increased educational advantages, the youth of the last few decades has not taken kindly to foundry work, with the result that moulders were becoming extinct and the trade a lost art. With the shortage of workmen came the idea of replacing them with machines, but little attempt was made to improve the conditions so that machine operatives could be retained and as a result common laborers drew the line at machine operating amid such surroundings as were met with in the foundry. This resulted in the employment of foreigners who, so far, have done most of the machine moulding in this country.

Must House the Machine

But now comes the difficulty which touches the tender spots. It has been discovered that the foundry is no place in which to install a machine, or in other words, it does not pay to keep a foundry in such a condition if machines are to be used. It has been found that no matter what precautions have been taken by the manufacturers of foundry equipment, the dust and dirt of the foundry is too much for a machine to endure, notwithstanding the fact

that human beings were expected to endure it through all the hundreds of years since foundry work began.

As a result of this latest discovery, an organization has been started which embraces practically all the manufacturers of foundry equipment and is known as the Foundry Equipment Manufacturers' Association. They have begun a determined campaign to induce foundrymen to make their foundries fit places for the equipment, and this campaign is already having its effect and to-day no foundryman would think of building a foundry without engaging an industrial engineer to design and superintend its construction. The result of this move has been most satisfactory and now we may look forward to a new era in foundry work. Like war, which with all its horrors, brings out inventions which would probably never have been thought of in the ordinary course of events, so the foundryman, with his careless indifference, has been the means of bringing out improvements which would not have been considered necessary had it been possible to continue in the old way.

Some Practices Contrasted

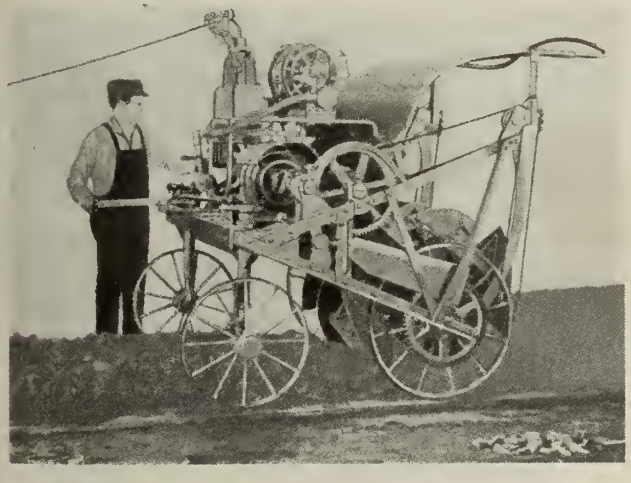
As a comparison between the methods of my boyhood and those of to-day, I will give a few examples which should convince the reader that the foundry is no longer lagging behind. In those days the apprentice was put through the entire foundry process, which included attending to cupola. This part did not appeal to him, but it was the proper thing to do and should still be the rule. He cleaned castings, helped cut over all the sand heaps in the shop, made cores, etc.

To begin with, the castings had to be removed from the sand by hand. To-day they are placed upon the table, suspended from the trolley car.

Then the water was thrown on from a pail—now it is put on with the sprinkling system.

After being wet down two men took opposite sides and with shovels smashed the lumps and cut the sand up in a heap. Now the sand-cutting machine straddles over the floor and in moving the length of the room leaves a finished sand heap in its wake.

In the core room the sand was prepared by getting a barrow load of sharp sand, a pail full of moulding sand and a measure full of flour. These were all pitched back and forward until considered mixed, after which the mass was run through a No. 8 sieve. It was then spread out



THE MODERN METHOD OF CUTTING UP THE SAND HEAP.

and punched full of holes with the shovel, and wet down in a similar manner to the sand heap and cut over several times to be sure it was mixed, when it would this time be run through a No. 4 riddle. Now the sand is mixed and tempered in a power-driven sand mixer.

Formerly the cores for every purpose were made in halves so that there would be a flat surface against the core plate. The halves would be dried and afterwards pasted together and dried again and black washed. Now, cores are jolted into the core boxes, or blown in by compressed air, and for straight round cores or even cores which are not round, a machine similar in many respects to a sausage stuffer is used and the core made perfectly

THE REGULAR WAY OF POURING COMPARED WITH THE METHOD WHICH IS COMING INTO VOGUE.

true, of any length required and with the vent hole the entire length.

More Laborious Work

In charging the cupola the only means of getting the coke and iron on to the platform was to carry it up the stairs and dump it on the floor, after which it was rehandled and put in the cupola. The cleaning away from under the cupola was equally as interesting. The coke, iron, cinders and sand had to be separated by hand, by picking out the coke and putting it in a basket. Bits of iron were put in a tote box and the cinders which did not appear to carry much iron were wheeled to the dump. The balance was put in the cinder mill along with the siftings from the sand, and from the gang-way a few chunks of pig iron put in with them, and the whole outfit tumbled until nothing was left but the iron. The cinder mill was, of course, well supplied with openings to allow the ground cinders to escape and that which was not heavy enough to fall to the floor did the next best and went all over the shop in the form of dust.

But It Is Different Now

To-day there is no part of the plant better taken care of than the cupola. Wet cinder mills grind up the cinders and separate the coke and iron and are dustless. Sand sifters of various types are provided for sifting the sand which will form the bottom, while magnetic separators recover the last speck of iron from the gangway and hoists to suit every condition are used to deliver the material to the charging floor.

The scratch room of to-day instead of being the dust-laden department of former days is as free from dust as any part of the plant. Instead of putting the castings in the old-fashioned tumbling mills, similar to the one back of the cupola, the tumbling is done in tight mills which are connected to exhaust fans which carry all the dust outside of the building. The grinding wheels are likewise connected to the same system. In addition to these there are new devices which were not known many years ago and which are not only labor-savers, but are reasonably dust-proof. Instead of the hand scratch brush and the

chisel and hammer, the modern foundry is equipped with revolving scratch brushes which are either operated on a machine similar to the grinding machine or carried about on a flexible shaft or on a portable grinding apparatus. Pneumatic chisels and sand blast apparatus of innumerable types do the work cheaper, better and healthier than formerly was the case.

The Modern Way of Pouring

But the part which is of vital interest to the employer and employee alike is the progress which has been made in methods of making and pouring the moulds. Up to a very recent date this was done entirely by hand and the moulder had to keep up a continuous motion every minute in the day or else he did not do a full day's work. To-day machinery does the bulk of it and the moulder's part is not the slavish job it used to be. As we have shown, the sand heap is prepared by machinery and no matter what class of mould is to be made there is a machine which can be used to advantage on it. In pit work the grab bucket cleans the pit out and the automatic sand sifter riddles the sand; the sand mixer prepares the facing sand; the pneumatic rammer does the ramming and the power crane does the lifting. In doing floor work the jolter does the ramming and if the work is such as will warrant the outlay, the jolting machine is built to turn the mould over. If the work is large the electric crane is used for lifting, but for medium work the pneumatic hoist is used to exceptionally good advantage and in many places the differential pulley block such as is built now can be used where no other device is as satisfactory. For small work such as has been considered as bench moulding, the squeezer has been perfected to such an extent that it will do most any job which was formerly done on the bench, and for work of a more difficult class the jolter, squeezer, stripper and pattern drawer offer a sufficient variety from which to choose the required combination to do practically any job.

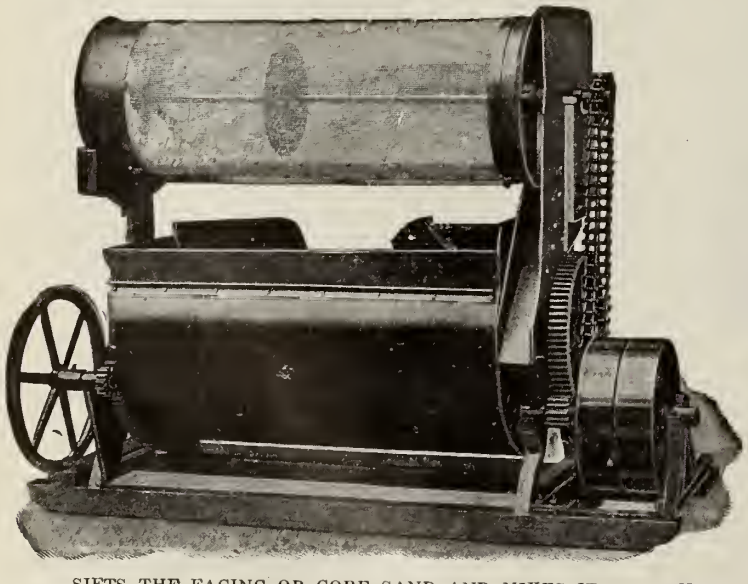
Even for the Job Shop

For jobbing work where the pattern-drawing device cannot be used to advantage the air hoist has many advantages. The air hoist is also used advantageously for lifting copes, handling cores, etc. For heavy lifting, cranes have been used for many years, but they were hand-operated. To-day almost any foundry will have electric cranes traveling the entire length of the shop and in addition have numerous small pneumatic cranes which can be lifted from place to place by the electric crane and connected to the compressed air pipe by means of a hose. In addition to this a modern foundry is equipped with trolley track connecting the cupola spout with the different floors, so that the moulder has no carrying of metal excepting on his floor and this is being dispensed with now to a considerable extent by the use of pouring systems which connect up with the main track. These pouring devices are so perfected that the ladle can be raised to any height and the mould poured to as good advantage as could be done by hand and with greater ease.

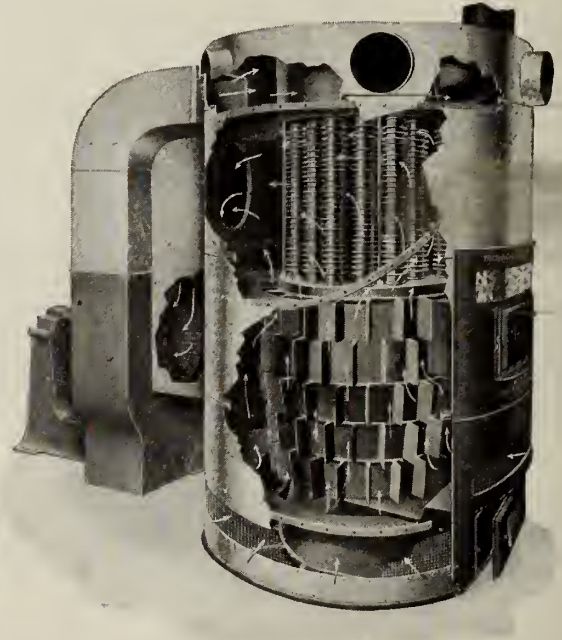
All told, the foundry of to-day is on a par with any other business, with the possible exception of the atmospheric conditions and these as we have already pointed out are being rapidly brought into line in order that the equipment will give the maximum of efficiency and the men who had been overlooked are automatically absorbing the benefits which were primarily intended for the machines.

By employing competent industrial engineers who have had actual experience in the foundry to superintend the construction as well as the heating and ventilating of the new foundries, it has been found quite possible to have good, clean air which does not stick to the oil on the machinery and which does not stick in the lungs and nostrils of the workmen.

CUTS CORES TO EXACT LENGTH AND TAPERS THE END.



SIFTS THE FACING OR CORE SAND AND MIXES IT IN ONE OPERATION



HEATS AND VENTILATES THE FOUNDRY AT THE SAME TIME.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question.—Kindly publish a formula for a good arsenic black finish. I wish to use same on polished steel goods and as an oxidize for brass parts.

Answer.—To prepare an arsenic black solution of 15 gallons, dissolve 5¼ lbs. of sodium cyanide in a portion of the water; when cyanide is dissolved, heat the water to about 200 deg. Fah., and in it dissolve 15 lbs. white arsenic and 12 ounces copper carbonate. Equip the solution with either cast brass or copper anodes and use a current tension of about 1 volt. A good deposit for polished surfaces may be produced in five minutes and will not require buffing. Exceptionaly heavy deposits may be produced in 20 to 30 minutes and buffed to a high finish in the usual manner. The solution will prove very satisfactory for brass oxidizing or by using stronger current greyish effects may be obtained. The solution acts very uniformly and is easy to operate and simple to manage. The absence of acids facilitates both easy operation and management. In case the solution requires refreshing, add the three chemicals in exact proportions as given here and no trouble will follow. Owing to the tendency of decomposition in the case of cyanide it sometimes becomes necessary to make small additions quite frequently. The metal content should remain practically constant for months without additions. The Beaume density may safely vary from 6 deg. to 15 deg.

* * *

Question.—I am very anxious to find out the length of time it would require to obtain a really serviceable coating of nickel upon brass pipe. I mean such a coating as would resist ordinary polishing for at least five or seven years. What test could be made to determine whether the nickel plating on a brass pipe offered for sale was of such a thickness? Does the strength of the current in the plating bath vary? And if it varies, does that affect the amount of metal deposited per hour? Shall consider it a great favor if you will kindly give me above information.

Answer.—A nickel deposit on a brass pipe should be at least two one-thousandths inch thick after buffing to insure satisfactory resistance against occasional polishing with ordinary metal polishes, and the varying atmospheric conditions, whether in doors or outdoors, for the period of time you mention.

To produce a nickel deposit upon a brass pipe which would meet these requirements we would subject the article to at least two hours' continuous plating in a nickel bath of normal concentration with a current density of five amperes per square foot. Voltage at bath not to exceed 2 volts. Slower deposition and prolonged treatment would yield even better results. Our best work on brass tubing has been obtained by plating approximately three hours at low current density in an electrolyte containing about 2 ounces boric acid per gallon. Bath slightly acid to blue litmus paper. The modern tendency is to deposit nickel quickly in so many minutes instead of so many hours. This hastening of deposition is absolutely wrong where durable nickel plate is essential.

The only truly satisfactory test we have ever used was to expose the base metal by the careful application of nitric acid to a small portion of the plated surface and then use the micrometer, or make micrometer tests before and after plating. If the physical properties of the deposit are found correct by testing a strip of the nickel coating, which has been removed from a previously prepared test piece by subjecting to bending, twisting, rolling or hammer test, then the bath should be maintained constantly in the same condition and the micrometer test will be found dependable.

We have grave doubts about your obtaining brass pipe plated commercially which will meet the aforesaid test. A thinner deposit might prove satisfactory in many instances, but for general trade purposes the thickness herein mentioned will be found much more reliable. With reference to varying current. Yes, the current varies with changes in temperature of bath or of any portion of the external circuit; it changes with varying chemical condition of the bath, the increase or decrease in metal content, the varying loads, the different cathode areas being plated, the resistance offered by imperfect contacts between anode or cathode and the rods from which these objects are suspended; poor anode corrosion eventually affects the current available; a wavering E.M.F. causes a varying current, etc. The varying strength of current does affect the amount of metal deposited per hour. One ampere of current will deposit a given amount of metal per second. Therefore, any reduction in the ampere hours means a reduction in actual metal deposited; likewise any increase in ampere hours means an increase in metal deposited. Slow deposition yields close-grained deposits. The time required to produce satisfactory nickel coatings for your purpose can be greatly reduced by employing mechanical means to facilitate rapid deposition of metal free from the detrimental effects of deposited or occluded hydrogen, that is, the cathode rod of tank could be kept moving during the time of plating, or the bath could be agitated by small jets of compressed air; the temperature of the bath could be raised to approximately 100 degrees F., and if a fluoro-borate nickel bath is employed the results would be decidedly improved in a given time. The thickness of deposit is not always a safe guide; a thin, close-grained, hard deposit will resist more wear than a soft, thick, coarse-grained coating, so be sure to test the physical properties of the nickel.

* * *

Question.—I have been operating a brass solution for the last two years. Have not had much trouble. Lately the work has had a brown scum on it. Scratch brushing takes the scum off and the brass is a nice yellow color. Have added cyanide, but results are no better. I would like to have the work come from plating tank clean, so I would not have to scratch brush it. This is first time it has bothered me. Please publish in next issue of your paper and you will greatly oblige me.

Answer.—When you are writing us for information, try and give us more details relative to the condition of bath or subject in question. In this case we have practically nothing to work on and must express our opinion in very general terms based on experience with brass baths of various compositions. Remove the brass solution from the tank and filter carefully, do not force it. If the density of the solution after filtering exceeds 10 degrees Beaume, remove a portion of the solution and dilute with clean, soft water until the density approximates 10 degrees Beaume. Stir well and add copper salt in small quantities; electrolyze with strong current. Now bring up color with small additions of zinc dissolved in cyanide. Keep sufficient free cyanide in bath to prevent rainbow colors on the work. The solution removed may be used to replenish the bath from time to time, or may be added to a cyanide copper solution a little at a time. Keep the metal strength of the solution up to a maximum but avoid exceeding 10 degrees density by being cautious when prompted to add chemicals to the bath. If you use arsenic or ammonia, give the matter a little thought and you may conclude that you are simply making hard work for yourself by continuing the use of these two chemicals. Heavy, bright, clean, smooth brass coatings are easily possible from very simple brass solution free from either arsenic or ammonia, and such baths are not freaky; they require little attention and the upkeep is less than with more complex solutions.

B. G. NEWTON, Manager
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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal Devoted to the Foundry and Metal Industries

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Tendencies of the Times

CONDITIONS among the metal trades industries are certainly not what we would like to see, but on the whole there is a glimmer of hope. Some foundries are quite busy, but others are not, and taking one with the other, there is no concealing the fact that there is room for improvement.

Inquiry elicits the fact that everybody is making preparations for the good times which are to come, but waiting for someone else to make a move. In passing through Hamilton we noticed that the Steel Company of Canada were still turning out their regular tonnage of pig iron, but while it is not selling as rapidly as it is being made, it is being piled up in readiness. The members of this company have never been accused of being deficient in business ability and they certainly would not tie up this amount of capital if there was any doubt about a market in the near future. The Dominion Foundries & Steel, also of Hamilton, is putting in additional equipment for the manufacture of steel plate and this in turn makes business for others who supply the equipment. The Brown-Boggs Company, of Hamilton, have taken the contract for some of this work, which along with their own work enables them to run their foundry to its capacity.

At Welland some of the foundries are busy and some are not. The Welland Iron & Brass Co. claim that the first three months of this year were the busiest in their history, but that April was about their slackest. The Canadian Meade-Morrison Co., of Welland, are very busy, having received a good big contract from the Imperial Oil Company. This did not necessitate taking on extra help as they were already working pretty well up to capacity, having just completed a big contract. At St. Catharines business was good. The Engineering & Machine Works were running a large staff of men and had work to keep them going for six weeks with good prospects for more. At the St. Catharines Brass Works, Mr. Riffer, the manager, reported that he had seen busier times, but was getting his share of work.

The Westinghouse Company have been busy all winter and are still busy. They are building a large addition to their machine shop in which to install their largest machines, which are too crowded in the present shop. The new wing will have a fifty-foot hoist to the traveling cranes which will be installed. Their foundry is not being enlarged, but it has been made available for more iron castings on account of a new separate building having been erected to house the brass foundry department. This new brass foundry is practically completed, but another core oven is in the course of construction.

At Niagara Falls, Ont., the foundries are running at a fair pace. The L. & P. Company are fifty per cent. busier than they were a month ago and are taking on some additional molders.

All told, things might be much worse than they are, bu still they might easily be better. The Hydro-Electric canal i furnishing a lot of work for not only those who are employe on the excavation work, but also for quite a number of foun dries which are making the castings which will be used in con nection with it. The order for 160 steel street cars which th City of Toronto is placing with the Canada Car & Foundr Co., of Montreal, should make that concern quite a lot busie for a while. With the opening of summer considerable neces sary public works will be proceeded with and conditions wil gradually right themselves.

The Unemployment Situation

DESPITE the fact that spring is upon us and that the usua activities which should accompany the advent of spring ar due, there is still a lot of unemployment. The number of un employed may possibly not be increasing, but the situation i getting more acute and questions arise which are hard to solv in a satisfactory manner. A short time ago several hundre unemployed men, including mechanics, returned soldiers an in fact men from almost every walk of life, raided the oute precincts of the City Hall in Toronto and endeavored to extor some sort of concession from the authorities. Some of thei demands were ridiculous in the extreme, but still the fac remains that they were out of employment and if they hav no income from their labors they must have an income fron some source or else starve.

However, they were dispersed by the police with very littl harm being done and incidentally very little good.

They also invaded Queen's Park and endeavored to interes the local legislators in their scheme to draw a salary withou having employment. This also met with negative results. I order to draw them along and ascertain their motives, a cabi net minister asked them the question, "Supposing there wer a number of houses to be built and you were offered twenty five or thirty cents an hour to work on the construction of sai houses, would you accept the offer?" To this they answere most decidedly that they would not.

Now, were they right or were they wrong? Would it b in the public interest to have them accept such a wage at thi particular time? Employers insist that men live up to al their agreements and men have a right to expect the sam from the employer. Now supposing, as is the case, contract ors of the city have arranged with their men to pay a wag approximating one dollar per hour, what would be the conse quences if the Government arranged a new rate of twenty-fiv or thirty cents per hour and engaged several thousand work men who would in turn be let out to new contractors wh

would spring into existence? Where would the old legitimate contractors come out? How could they live up to their agreements with their men and compete with these new prices? It is a tickish question.

One thing which must be remembered is that we all depend on the farmer. He is the man who brings the money into the country and if he cannot sell his produce in competition with the world he cannot sell it at all, outside of Canada. If he does sell in competition with the world he does not propose to pay the prices which he has been paying for that which he has to buy. The manufacturer who supplies him does not feel like cutting the prices very much unless he can get it out of his men, and they do not want to work for less unless they can live more cheaply, and so it goes round like an endless belt, making about as vicious a circle as when the prices were on the upgrade. It may be a consolation to know that we are no worse off than any other country and possibly quite a bit better, but still there is the unemployment question unsettled, and how is it to be settled? Of course there are two sides to every question. When the workingman demands a living, why does he demand it of someone else? Why should he think that someone else should worry about him? If he is the producer, why does he not produce something and sell it and use the money to live on? It is easier said than done, but the employer is in the same position. If he cannot sell his goods he cannot pay men for making them. The only solution which we can offer is to abide by the lesson of Joseph, divining the Egyptian king's dream, "During the fat years provide for the lean years which are sure to come."

Those of us who did not have sufficient forethought to take advantage of the years of plenty which have just passed will perhaps know better next time; but for the present we should not see any one in want and what employment there is should be divided among as many as possible. The idea of unemployed men asking for regular wages the same as those who are employed is certainly a novel idea and if carried out would undoubtedly put an end to the employer's worries about how to find employment for his men. There would not be many men wanting employment. The unemployment situation is certainly serious, but the summer just opening up will make it less severe and by next winter surely those who are now unemployed will have found means of support other than trying to get it without work.

Efficient Foremen Essential

"WHAT is the greatest problem you have to face in the management of your plant?" I asked Mr. Kenneth Dunn, superintendent of the McClary Mfg. Company.

"The difficulty of obtaining good foremen," was the immediate reply. "And what I mean by good foremen are men who are fully trained, both technically and as executives—men who can figure on estimates and costs, understand time chart principles—in other words, men who can be relied upon to administer their different departments efficiently."

Mr. Dunn went on—"The trouble with the average foreman of to-day is that his early education has been sadly neglected. That's not the man's fault. It's the fault of the educational system. By far the greater number of to-day's foremen started to serve their apprenticeship at very immature ages, many of them just at the age when they should have been developing their brains instead of their arms.

"You know, I am a firm believer in every boy being fitted for life with a proper education. Every boy should have at least a few years in high school. A great many of the things we learned in high school were looked upon by us at the time as unessential, especially," he continued, "subjects like Latin, Greek, algebra and numerous other studies so irritating to the average boy. But in reality subjects of this sort are splendid brain food and teach a boy to think for himself, a faculty with which every man must be endowed if he is to go far in the industrial world to-day.

"The manufacturer of to-day wants as foremen men with brains who know how to apply them. Keen business competition demands this. Every effort is being made to cut down costs and excessive costs are in the main due to inefficient methods and wastage of material, due to ignorance on the part of the employees. Now it's up to the superintendent to see that a plant is run economically and efficiently, but where he has many different departments in his care he must depend on his foremen and if these fail through lack of education to keep their end up, well, something's going to happen."

"Do you think an intelligent reading of technical books and papers would go far towards solving the trouble?" I asked.

"Well, yes, to a certain extent," he replied. "Personally, I'm a great believer in technical papers and subscribe for a great number. What I have in mind, however, is an improvement even on the technical paper. Some of the most prominent American universities, such as Yale and Columbia, are strongly advocating the training of promising workers in the various branches of industry who will later develop into good executives. This matter has received the co-operation of many of the leading American manufacturers, who are sending some of their more promising workers to these universities, where special courses of study in executive and higher technical training are given. I am firmly of the opinion that this will become a regular practice with our own Canadian manufacturers when such courses take their place on the regular curriculum of Canadian universities."

Sounds All Right

IF Mr. Dunn is sincere, and we presume he is, he is about the only superintendent that we have met who viewed things from this standpoint. Canadian Foundryman has always stood for education, but this word education can be transformed into a lot of different meanings. If a man or boy is being trained for a foundry foreman he should forget that there is any other department and put his entire attention to the foundry. About the most thankless position which any man can fill under the present system is that of foundry foreman. And what education he has can not, as a rule, be used to any advantage. What use any further education would be is a mystery unless he is permitted to put it to service. As we have pointed out on different occasions, the little jobbing foundries can sell castings to the big establishments for less money than the big fellow can make them simply because the theories and efficiency doctrines which are concocted in the office of the big plant are eliminated in the little one.

The rule in the big plant seems to be to look upon the foundry as a place which exists for spite and where brains are unnecessary. It is usually considered necessary to have some fellow come from somewhere other than the foundry in order to keep an eye on the foreman. Now, if we have properly educated foremen, is it proposed that this procedure will stop? If it is, there will be something for the foundry worker to look forward to and something which we shall be glad to encourage, but if the education is to be gleaned from schools manipulated by theorists, then we are better off without them. What we want is that manufacturers who have a foundry in connection with their plant should realize that the foundry is a place where a lot of money can be lost if not properly managed and where real, common-sense knowledge is required in place of the theory handed out by the average efficiency expert. Certain it is that the skilled foundryman is less in evidence to-day than at any period in the history of the business, but of course this is not what those higher up mean when they speak of education. The idea is that there is nothing to know as far as the work goes and that executive ability is the main requisite. With this we certainly do not agree. Unless the man in charge of the foundry is thoroughly posted on the art and science of foundry as well as the mechanical features and in addition has had sufficient experience, he cannot make a success of the foundry, no matter how much executive ability he may have achieved. Education of the proper kind is essential, but foundry work is foundry work and nothing else and no attempt should be made to mix it with other lines of occupation, because it will not mix.

Scraps from The Foundry Scrap Pile

Smart's Brockville Furnaces, Ltd., is capitalized with capital stock of $100,000 and head office at Brockville, Ont.

* * *

The Hall Zryd Foundry Co., Ltd., Hespeler, Ont., is in the market for several motors, second-hand preferred, of 15 to 30 horsepower, 550 volts, 25 cycle, three phase, 750 r.p.m.

* * *

Starting in Foundry Business. — A company of molders is being organized at Lindsay, Ont., to open up and operate a grey iron foundry and is in the market for an electric motor. Quotations on foundry coke and pig iron are also required.

* * *

New Plant Starts.—The electric steel foundry of the J. W. Cumming Mfg. Co., New Glasgow, N.S., is now in operation, under the direction of J. M. Robertson, Montreal, the designing engineer of the plant, and C. A. Pascoe, metallurgist, and Sanford Davis, electrical engineer, of Montreal.

* * *

The Canada Iron Foundries, Limited, Fort William, Ont., whose pipe foundry was described in the January issue of Canadian Foundryman are now preparing plans for another $150,000 addition. This will be a foundry for the manufacture of car wheels, and like the pipe foundry will be equipped with facilities for turning them out by a different process than that of the old familiar man power.

* * *

The Keller Pneumatic Tool Company announce the removal of their Chicago branch to larger and more up to date salesrooms and service station. After May 1st this branch will be located on the main floor in the Transportation Building, No. 624 South Dearborn Street, Chicago, where a complete stock of tools and parts will be maintained. Mr. J. C. Campbell, district manager, will be delighted to have his friends call.

* * *

Installing More Equipment—McIntyre and Taylor, 503 Queen St. West, Toronto, have just installed two more steel exhaust tumbling mills, manufactured by the R. McDougall Co., Ltd., Galt, Ont. This foundry has been in operation for less than a year and was well equipped to begin with, and the fact that they are adding these two additional units does not look as though any panic was facing them.

The Electric Furnace Construction Co., Philadelphia, announce that the 10-ton "Greaves-Etchells" electric furnace installed by their English office at the works of the Sociedad Espanola de Construccion Naval, Spain, has been successfully started up. This is the first large electric furnace to be operated in Spain.

* * *

James Wilson, who for many years operated a foundry and machine shop at Merritton, Ont., doing a line of jobbing in medium and heavy castings and machine work, died in the early part of March and the plant is now offered for sale. It is a stone structure with a capacity for about four molders and twelve to fifteen machinists. There is also a department for the manufacture of wire cable.

* * *

The E. S. Bryant Pattern Works, 201-203 Glengarry Avenue, Windsor, Ont., announce that their new plant is now in full operation. This is a Canadian branch of a Detroit concern of long standing and is fully equipped with the most modern machinery and under the supervision of experienced mechanics. They are prepared to make patterns in wood and also metal of any kind required. The equipment required for finishing the metal patterns puts them in a position to do light machine work and they announce that they are prepared to take orders for light manufacturing in addition to their regular line of pattern making.

THOMAS NELSON REGAINING HIS HEALTH

It is with extreme pleasure that we are able to announce that Mr. Thomas Nelson, who for a number of years was foundry superintendent at the Architectural Bronze and Iron Works, Toronto, is regaining his health. As a foundry superintendent Mr. Nelson stood high in the estimation of his employers as well as in that of the men under his control, and it was with considerable reluctance that he was allowed to resign his position, but the fumes from the molten metal in the bronze department were too much for his constitution and he found his health being undermined. Some time ago he moved to St. Petersburg, Florida, where he reports that he is greatly improved in health.

The National Shipbuilding Co., Goderich, Ont., who have a foundry in connection with their plant for building their own engines and other iron work which goes to make up a ship, have launched into another line of business which will keep their foundry in operation more steadily. They have just engaged some additional hands and are now manufacturing a line of flax-pulling machinery.

* * *

C. Rehder & Son, Bowmanville, Ont., who operate a foundry in that town and make a specialty of light grey iron and light steel castings, are having plans prepared for a new foundry to cost $60,000. This company operate an electric furnace for the steel castings, and during the war successfully operated it on cast iron turnings, making first-class iron castings. They also operate an electric welding department and a fully equipped plating and polishing department.

* * *

Takes Off Heat At New Foundry.—The first heat at the new Grinnell foundry, Toronto, was run off on Wednesday, April 4, and was a decided success. It consisted mainly of snap weights and other necessary appliances for the foundry, and incidentally gave the various units of equipment a good try-out before getting right down to business. The company is well supplied with orders for pipe fittings and fire extinguishing appliances.

* * *

Joliette Castings and Forgings, Ltd., of Joliette, Quebec, have recently completed the installation of a one-ton "Greaves-Etchells" electric furnace for the manufacture of manganese steel and alloy steel castings, particularly for the making of wearing parts for mining machinery. They have likewise installed a new five-ton Northern Electric travelling crane in the new building and extended the cleaning shop 100 feet, with a width of 40 feet, in which is installed a new continuous car annealing furnace and a complete oil storage and pumping system. They have also built a new sand blast house equipped with Pangborn sand blast. A new power house and machine shop has been erected with the necessary machinery for facilitating delivery of finished castings and specialties.

Catalogues

The Truscon Laboratories, Detroit, Michigan, are distributing their technical pamphlet No. 8, on the subject of waterproofing of concrete. The waterproofing of concrete is a subject on which there is not an over-abundance of information to be found in the text books. In this pamphlet the endeavor has been to supply the need of a text-book on the fundamentals of this important subject. It has the advantage of being short and concise. It can be read in half an hour. On account of its interest to architects, engineers and builders we are requested to announce that it will be sent free on request.

* * *

Volta Electric Furnaces is the title of a catalogue being distributed by the Volta Manufacturing Co., Ltd., Welland, Ont. The contents include electric steel and iron furnaces, ferro-silicon furnaces, ferro-alloy furnaces, electric furnaces for melting copper, brass, zinc, aluminum and babbitt, electric winches, automatic regulators, hand controllers, current transformers, electric holders, roof coolers, etc. The illustrations show the furnaces of different types for the different purposes, and also show the interior details as well as the various accessories. Many valuable receipts and tables are also given.

* * *

Hauck Burners for Foundries, Boiler, Machine and Repair Shops, Bulletin No. 12, is a neat and instructive catalogue, being distributed free on request by the Canadian Hauck Burner Co., Ltd., Port Hope, Ont. The contents include the various types of Hauck burners and their purposes. In the foundry the list includes lighting the cupola, drying molds, heating and drying ladles, patching cores, burners for core ovens and melting brass. In the machine shop and boiler shop as well as miscellaneous other departments the uses are also shown. In addition to the catalogue is a cupola lighting instruction sheet which explains in detail the course of procedure in lighting the fire in the cupola without the aid of kindling wood. A page giving the names of some fifty Canadian foundries now using the burner is also included.

* * *

W. S. Rockwell Company, 50 Church St., New York City, are mailing to the trade their bulletin No. 228 ilustrating their various types of burners for the use of oil and gas fuels for industrial heating.

Emphasis is laid on the fact that the real question is not alone one of burner selection, but rather the successful conduct of a heating or heat-treating operation as measured by the cost of production of a quality product.

The real "efficiency" of a burner; the selection of type and size to suit nature and pressure of fuel and atomizing element; methods of attaching burner plates; prices of different sizes in each type of burner; a chart showing the comparative cost per million B.t.u. at unit prices—these features will no doubt interest those of our readers who wish to keep in touch with developments relating to fuel and methods and means of utilizing it to the best advantage.

* * *

The Air Reduction Sales Company, 120 Broadway, New York, have secured control of the National Carbide Corporation of Virginia, with a new plant at Ivanhoe, Va., and beginning May 1, 1921, will direct the policy and control the operation and sales of the Carbide Corporation.

With the acquisition of this carbide plant, the Airco organization (Air Reduction Sales Company) place themselves in the unique position in the oxyacetylene welding and cutting industry of manufacturing and selling within their own organization everything necessary in the use of the oxyacetylene flame. Airco products now include oxygen, acetylene, welding and cutting apparatus and supplies, acetylene generators, carbide, nitrogen and argon.

Carbide produced at the new plant will be marketed in the future as Airco carbide through the chain of Airco distributing stations stretching over the country.

* * *

Sullivan Machinery Co., Chicago, Ill., are mailing three new catalogues along with their April house organ, "Mine and Quarry." They are all interesting and instructive and are as follows:

Drill Sharpening Machines, No. 72-E, describing the new Sullivan Class B light weight drill sharpener, as well as the standard Class A machines with especial reference to the making of genuine double taper bits, etc.

Bulletin 77-B, Angle Compound Air Compressors, including mention of the company's single stage or duplex angle machines for low pressure.

Bulletin 77-A, illustrating Sullivan mine car compressors, operated by electric motor, for use in rock removal underground in coal mines particularly.

Mine and Quarry for April, including original articles on railroad water stations, air lift pumping, new ironclad coal cutter, the romance of the diamond drill, sharpening stone cutting tools by machine, theory and practice in the drill sharpening shop, and rock removal in collieries by compressed air.

WANTS HEAVY MOLDING SAND

Editor Canadian Foundryman.—Would be pleased to have you advise us if it is possible to secure in Canada a first-class foundry sand suitable for heavy work in green sand molds.

Will appreciate any information you can give relative to this matter, and oblige, yours very truly,

WELLAND IRON & BRASS CO.,
Per E. J. Anderson.

HAVE NO FEARS REGARDING THE FUTURE OF THE FOUNDRY BUSINESS

Messrs. Hillis and Sons, Limited, Halifax, N.S., are the type of business men who inspire the proper kind of zeal into thoe who are afraid to venture until some one else leads. They manufacture stoves and ranges, and in addition do a general line of foundry and machine shop work, pattern making, sheet metal work, nickel, copper, brass and silver plating. They write that their entire plant was destroyed in the explosion of December, 1917, when almost the entire personnel of the company lost their lives. Their plant as it now stands was necessarily a hurry-up structure, but it is not their intention to remain in it very long. It is their intention to erect a brick, or possibly concrete, foundry of much larger dimensions as soon as conditions warrant it, which they think will be soon as they are almost as busy as ever, but report business a little behind what it was at this time last year.

THE PRICE OF PIG IRON

Following the forcing of the pig iron market in the States down to $25, Canadian makers have placed their price at $34.14. Orders are small, one dealer regarding an order for a car of 50 tons as a pretty good piece of business this week. Canadian makers can hardly stand to make a very big profit at this new price. Some of them have great piles of coal which was brought in at a time when prices were high, and the same can be said of their ore. The price of pig has been steadily reduced. Some of the stacks are piling pig iron in their yards, one company expressing a willingness to do this to the extent of 20,000 tons, before blowing out.

LARGEST AEROPLANE ENGINE ON RECORD

Great Britain claims the credit of having built the largest aeroplane engine on record. Recently there was tested in a factory near London, England, an engine which developed over one thousand horse power. This engine, which was built to the order of the Royal Air Force, has sixteen cylinders, weighs close on one ton, and is most economical in fuel and oil consumption. Its influence on the range, speed, and carrying capacity of aeroplanes is expected to be considerable, and its performances in the air are awaited with the keenest interest by aviation experts.

Expensive Both Ways

The Elder: "You should begin to save up for a rainy day."

The Younger: "I will as soon as I get through saving up for a dry day."—Detroit Gateway.

Scrap Yard To Be The First to Reflect Turn of the Market

An improvement in the market conditions, or in business generally, must be preceded by an improvement in the scrap metal trade. That is the statement of one of the best informed men in the business.

"It has been so in many past experiences and it will be true again in the present case. Iron and steel will show no improvement until there is a betterment in the scrap of these lines and the same can be said of copper. There will be no movement in goods that copper goes into—and they are numerous—until there is a stiffening of prices in the scrap market.

"It is true," our informant concluded, "that coming events cast their shadows before, and in this case the shadows must first fall on the scrap yards. Watch and see."

Number Dropping Out

A representative of one of the largest scrap metal yards in the Dominion is authority for the statement that about 50 per cent. of the scrap metal yards in the country have gone out of business during recent months. "Only the well-established yards can stand such a period as we have been going through, and there is nothing to indicate an improvement. The scrap metal market must improve before other lines do. This may seem to be a queer statement, but it is an absolute fact, and anyone who watches markets over a period of years can prove that it is so. Until the prices of iron and steel scrap strengthen you are not going to see an improvement in the lines into which these go. Until the copper market gets better you are not going to see an improvement in the lines into which copper goes. Coming events cast their shadows before, and they fall right in the scrap yard. Watch and see," was his parting advice.

MEN WERE GIVEN ACCESS TO THE BOOKS AND RECORDS OF COMPANY

HAMILTON.—The Industrial Council of the International Harvester Co. has been called upon to fix the wages of the plant, about as severe a test as could be put on the organization.

One day recently bulletins containing the report of the works council of the International Harvester works on the question of wage reduction were posted in the various departments of the big plant here. The report was issued later, and is said to be the unanimous finding of the council, which consists of eight representatives of the employees, elected by the workers in the different departments, and an equal number of representatives of the company. The workers' representatives spent five full days in investigating the company's books concerning cost production, orders and other matters, and went into the wage returns of all the employees. As a result, the members reported, among other things, that:

"We, the employee representatives, find that owing to the lack of orders on account of the high cost of machines and large stock on hand, the company's proposed reduction of 20 per cent. on day and piece rates, and 10 per cent. on salaries, seems necessary, and wish to go on record as regretfully accepting same in hope that the plant may be kept running.

"After carefully reviewing the reductions made so far, and the further reductions necessary to meet the objective asked for, and having tried in every way, without success, to find some other way of accomplishing the result, we endorse the present method of reducing the day and piece work rates in force November, 1920, until a total reduction of 20 per cent. is reached."

The wage reductions made so far by the company on the November scale average 13½ per cent., and according to the finding of the council the company is warranted in making a further cut amounting to 6½ per cent.

The council presented its report to F. J. Gernandt, the local superintendent, who expressed satisfaction at the finding, which he believed would be the means of averting a shutdown of the plant and turning over 1,500 hands out of work.

The works council of the Oliver Plow Works, a subsidiary of the International Harvester Company, is now preparing a report.

Report Well Received

It is stated the finding of the council has been well received by a majority of the hands employed at the Harvester works, and will be the means of steadying the labor market, it is thought, by many other workers.

An explanation in regard to the 10 per cent. cut in the price of the company's products not taking place till next year was made by an officer, to the effect that the product marketed this year was made up months ago, with wages and material at the top price.

SEASONED CASTINGS

A subscriber has submitted the following article for publication and incidentally for an opinion. If any of our readers are prepared to advance any suggestions we will be glad to receive them, but candidly it looks to us about the same as it does to the subscriber who submitted it. Of course the word "defect" may not be intended to mean a flaw. Every casting is subject to internal strains and if allowed to stand for a few months will right itself to some extent, which is to some extent similar to being annealed. In some plants where high-class machinery is built it is common practice to let the castings stand for some months before machining them, and then they are only rough machined and allowed to stand for another while. The molecules in the iron move slowly but they move nevertheless and if this is what is referred to it is correct to the best of our knowledge and belief, but good castings becoming defective after months of seasoning is rather vague information. Following is the article:

Seasoned Castings

"Cast iron will season just the same as wood. A defect not noticeable in a green casting will show up after months of seasoning. All castings made in our foundry are allowed to stand and season for six months to a year before they are used. Thus any defect that may not have been noticeable in the green casting is discovered before a casting goes into use."

The above is copied from a certain manufacturer's catalogue. I must admit I never heard of such a thing, and shall be glad if, through your columns, you can advise whether there is anything in this statement or not. If so, will you kindly specify what particular kind of a defect will develop in a casting because it is six months or a year old, that hasn't developed when it is a day old, if it has thoroughly cooled?

Glad to Help

Boy Scout (to old lady): "May I accompany you across the street, madame?"

Old Lady: "Certainly, sonny. How long you been waitin' here for somebody to take you across?"—Judge.

POSITION WANTED

FOUNDRY FOREMAN REQUIRES POSITION; 15 years' practical experience. Marine general jobbing or machine work. Have a good general knowledge of moulding machines and cupola practice. Apply Box 5521, Canadian Foundryman. (c5f)

HAMILTON

FOUNDRY FACINGS

MADE IN CANADA

FOUNDRY SUPPLIES

XXX Ceylon

Pure Ceylon Plumbago for use on the heaviest green sand castings. This facing gives a bright colored casting with a perfectly clean surface.

No. 206 Plumbago

This is a splendid general purpose lead. May be used wet and makes a perfect wash for dry sand molds.

Hamilton Facings will not run before the iron, burn, or brush off the mold. If our facings are not all we claim they may be returned at our expense. Quality, service, uniformity and dependability are combined in every barrel—and every barrel carries with it our guarantee.

Gambite

Gambite is superior to any Liquid Core Binder on the market. It is made from the best quality Canadian Spruce and contains 52 per cent. of soluble solids; is free from gas and can be used alone or in combination with oil, flour, rosin or any dry compound.

30 Years' Experience

THIRTY years' experience is bound to place a firm in an excellent position to manufacture high grade products at low prices.

We are able to make advantageous purchases of raw materials which would be impossible were it not for our experience.

We have also learned thoroughly those manufacturing secrets without which no firm can keep its products uniform.

In buying Hamilton Supplies you get quality—pay no duty—avoid the trouble and delays of the customs—get prompt deliveries, and—you help Canada by keeping your money in the country.

Consider carefully when buying. Remember that, "Thoughtful expenditure is wise economy."

The Hamilton Facing Mill Company, Limited

Head Office and Mill: HAMILTON, ONTARIO

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON

Gray forge, Pittsburgh	$25.00
Lake Superior charcoal, Chicago	40.50
Standard low phosphorous, Phila.	41.50
Basic, Valley furnace	26.00
Bessemer, Pittsburgh	28.96
Canadian foundry pig	34.10

NEW METALS

	Mont.	Tor.
Lake copper	$18.00	$17.50
Electro copper	17.50	17.50
Castings copper	17.25	18.00
Tin	38.00	39.00
Zinc	7.75	7.50
Lead	6.50	7.50
Antimony	8.00	8.25
Aluminum	34.50	30.00

OLD MATERIAL

[Dealers' average buying prices]

	Mont.	Tor.
Copper, light	$ 8.50	$ 9.00
Copper, crucible	11.00	11.00
Copper, heavy	11.50	11.00
Copper, wire	11.00	11.00
No. 1 mach. comp.	9.50	9.75
New brass cuttings	7.00	8.00
Red brass cuttings	7.50	8.00
Yellow brass cuttings	5.00	6.00
Light brass	3.50	5.00
Medium brass	5.50	6.00
Scrap zinc	4.00	4.00
Heavy lead	3.50	4.00
Tea lead	2.00	2.00
Aluminum	12.00	10.00
	Per gross ton	
Heavy melting steel	$ 9.00	$14.00
Boiler plate	10.00	12.00
Axles (wrought iron)	22.00	20.00
Rails	12.00	14.00
Malleable scrap	12.00	20.00
No. 1 mach. cast iron	22.50	25.00
Pipe, wrought	8.50	8.00
Car wheels	25.00	25.00
Steel axles	18.00	18.00
Machine shop turnings	5.00	6.00
Stove plate	20.00	20.00
Cast borings	3.00	7.00

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.03¾
Acid, nitric	.10
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium, sulphate	.30
Arsenic, white	.18
Copper, carbonate, anhy.	.35
Copper, sulphate	.10
Iron perchloride	.62
Cobalt Sulphate	.20
Lead acetate	.30
Nickel, ammonium sulphate	.16
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite, per cwt.	6.50
Sodium phosphate	.15
Tin Chloride	.80
Zinc Chloride C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated.

PLATING SUPPLIES

Polishing wheels, felt	$4.50
Polishing wheels, bull-neck	2.00
Emery in kegs, Turkish	.08¾
Pumice, ground	.06
Emery glue	.30
Tripoli composition	.09½
Crocus composition	.12
Emery composition	.10
Rouge, silver	.64
Rouge, powder, nickel	.38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	$ .08½
Grits, 0 and finer	.06

COPPER PRODUCTS

	Mont.	Tor.
Bars, ½ to 2-in.	$30.00	$34.00
Copper wire, list plus 10%		
Plain sheets, 14-oz., 14x60 inch	32.00	38.00
Copper sheet, tinned, 14x 60, 14-oz.	38.00	42.00
Copper sheet, planished, 16 oz. base	44.00	48.00
Braziers', in sheets, 6x4 base	36.00	41.00

LEAD SHEETS

	Mont.	Tor.
Sheets, 3 lbs. sq. ft.	$ 9.50	$14.50
Sheets, 3½ lbs. sq. ft.	9.25	14.00
Sheets, 4 to 6 lbs. sq. ft.	9.00	13.50

Cut sheets, ½c lb. extra.
Cut sheets to size, 1c lb. extra.

SHEETS

	Mont.	Tor.
Sheets, black, No. 28	$ 6.50	$ 6.50
Sheets, black, No. 10	5.50	5.50
Can. plates, dull, 53 sheets	12.00	13.00
Can. plates, all bright	14.00	14.00
Queen's Head, 28 B.W.G.	10.75	10.75
Fleur-de-Lis, 28 B.W.G.	10.00	10.00
Zinc sheets	13.00	15.00

Pittsburgh Markets

PITTSBURGH, May 5.—The steel market situation might be summed up very briefly by saying that the market is very steady and also extremely quiet. As to steadiness, the prices recently developed are being strictly maintained, and while in pre-war times that was not an unusual but rather the usual condition, it has not been so usual since the war, since for two-thirds or three-fourths of the time the independent and Steel Corporation prices have been different, the independents being usually either above or below the Corporation. That is the better way to put it, rather than to say that the Steel Corporation has been above or below the independent prices, since it is the independent prices that have done nearly all the fluctuating.

Pig Iron and Coke

Foundry iron is easier. While some producers are still quoting $25, valley, and state they are picking up small orders from regular customers, one producer has gone to $24.50 and it is possible $24 might be done, the price at any rate being quoted by some middlemen, perhaps on resale iron.

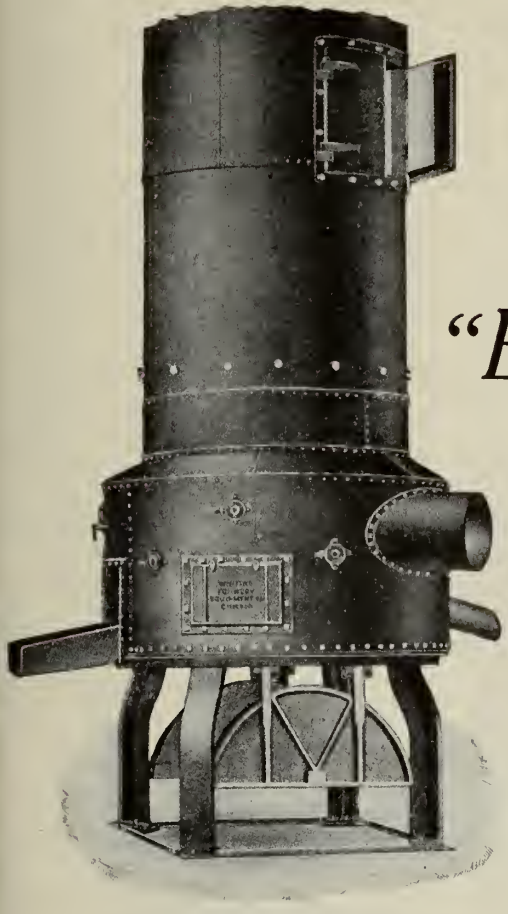
Merchant furnaces that were holding basic iron at $25 have withdrawn the figure and have no open quotation. When any worth while inquiry develops they will decide what to quote. A steel works interest that sold over a month ago at $23 has gone up to $25. Lower sellers remain, and the question just now is whether they will develop enough competition with each other to do $22 or less, or will withdraw on account of other producers having gone up, and with the idea of giving the steel market some sentimental support. One valley steel interest has sold several small lots of basic iron at intervals at $22.50, while a Canton interest states it was quoted as low as $22 on its recent inquiry for 10,000 tons for May. No purchase was made as the company will blow in its own furnace instead, probably because it has a by-product coke plant that would make the operation more economical than that of a furnace selling pig iron at $22 and buying Connellsville coke. The question is whether the $22 quotation made for Canton was from Weirton, valley or Cleveland, as the three points have the same freight to Canton, $1.96.

Connellsville furnace coke shows quite a range. Sales three weeks ago were at $3.50, while since then coke has sold both lower and higher, at $3.25 or $3.30 and at $3.75, possibly at $3.90. It is unusual for there to be such a spread. Some furnaces believe they could buy at $3 if they could offer a good tonnage, sufficient to operate a coke plant economically. As it is, most coke producers keep their plants idle as there is less loss in that than in running to produce the very small quantities for which orders could be secured. Spot foundry coke remains at $5 to $5.50.

The Steel Corporation is undoubtedly receiving more business than formerly, or since it reduced its prices, this carrying with it a modification of contracts.

FACINGS
Foundry Supplies
and
Equipment

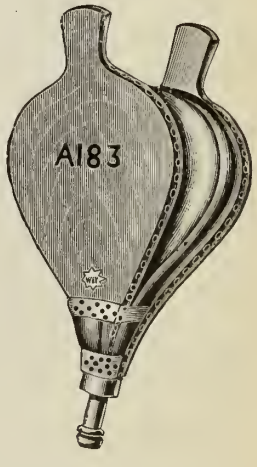
"Everything for the Foundry"



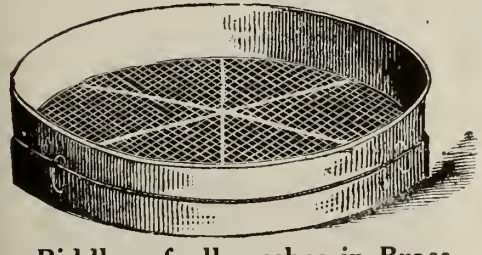
Whiting Cupolas and Equipment

Hand-operated Cranes of various capacities and designs

Branford Vibrators



Bellows with the best of leather and workmanship



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ONE NO. 2 M. EUREKA ROCK CRUSHER, size 8" x 12" with 11 H.P. gasoline engine, and folding elevator, all complete and mounted on steel chassis with wheels. This outfit is built especially for road building and road repairing, where frequent changes are required. Also adapted to all kinds of contract work. Practically new. Bargain price. Address Black Donald Graphite Co., Ltd., Calabogie, Ont. (crf)

SAND RIDDLES—YOU CANNOT AFFORD TO be without this sand riddle. Ready for immediate shipment. Operated by electricity. This is a real bargain. Write for particulars to Box 4321, Canadian Foundryman. (cmf)

CLIMAX GREY CORE COMPOUND SAVES dollars' worth of labor. Climax Core Wash remains in suspension, will not wash, buckle or rub off, and it cleans easily. A trial will convince you. Write for samples and prices to Hamilton Facing Mill Co., Hamilton, Ont. (crf)

FOR SALE—SHOVELS, BRASS AND GALVANized Riddles, Bellows, Core Ovens, etc. Write for particulars to Box 3021, Canadian Foundryman. (cmf)

FOR SALE—GRAND ROTARY SAND RIDDLE. Absolutely new. Box 1021, Canadian Foundryman. (cmf)

TUMBLING, TILTING AND BURNISHING barrels for sale. Made in Canada. Box 2021, Canadian Foundryman. (cmf)

FOR SALE—AUTOMATIC ROTATING TABLES, most durable constructed table made. Write, mentioning "Canadian Foundryman," for particulars to Mussens Limited, Montreal (crf)

IF YOU HAVE IRONWORKING OR WOODworking machines for sale, call or write Canada's largest dealers in new and used machinery. Write, mentioning Canadian Foundryman, to H. W. Petrie Ltd., Toronto. (cff)

USED AND NEW WOODWORKING MACHINery, also metal lathes and small tools, belting and transmission. Write, mentioning Canadian Foundryman, to General Machinery Co., 67-69 Frederick St., Toronto. Main 2200. tf.

MACHINERY WANTED

WANTED FOR CASH—WOODWORKING MAchinery of every description. Box 4121, Canadian Foundryman. (cff)

ELECTRIC MOTORS WANTED FOR CASH—Fisher Electric Co., new warehouse, 77 Front Street East, Toronto, Ont., Main 3288. (cmf)

SITUATIONS WANTED

WANTED—POSITION AS FOUNDRY SUPERintendent, qualified with practical experience, engineer's training and business ability. Box 3521, Canadian Foundryman. (c6f)

FIRST-CLASS MOLDER WANTS POSITION as foreman or assistant; have necessary ability and enthusiasm to make good. Expert on latest methods for economical production. Open shop preferred. Canadian and United States references. Distance no objection. Salary a secondary consideration. All correspondence strictly confidential. Address inquiries Box 2512, Canadian Foundryman. (c5f)

SITUATIONS VACANT

WANTED—TO WORK ON SAMPLES AND patterns, expert cabinetmaker who understands blue prints and can do his own machine work; this is a steady job at good wages. Box 4521, Canadian Foundryman. (c5f)

WANTED

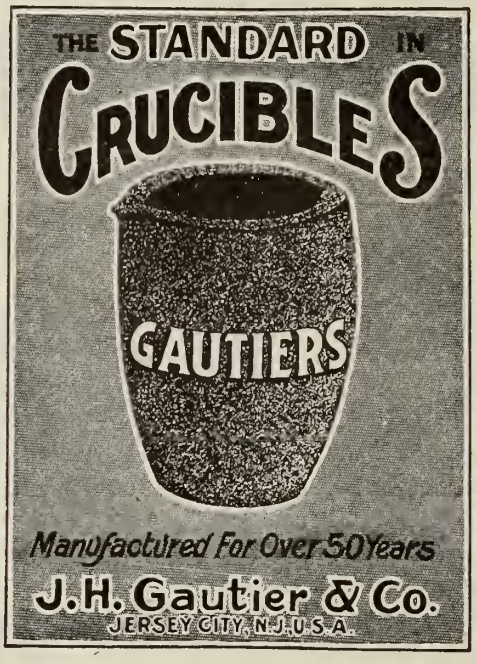
SMALL FOUNDRY WANTED FOR PRODUCing gray iron castings, etc. Will rent or buy. Would like to hear of foundry equipment for sale, suitable for small foundry. State particulars. Box 1521, Canadian Foundryman. (c5f)

PATTERNS

LET US SOLVE YOUR PATTERN PROBLEMS. Wood and metal models and aluminum plate work. Write, mentioning Canadian Foundryman, to the Hamilton Pattern Works, 120 Adelaide St. W., Toronto. (crf)

WOOD AND METAL PATTERNS—OUR WORK is good and prices right. Give us a try. Write for particulars, mentioning "Canadian Foundryman," to Downer Pattern Works, 1-3 Jarvis St., Toronto.

Canadian Pattern & Castings Co. Ltd.
49 Drouillard Road
FORD CITY, ONTARIO
Wood and Metal Production
PATTERNS
Brass, Bronze and Aluminum
CASTINGS
In Production Quantities



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OUR WORK IS GOOD AND OUR PRICES RIGHT
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DON'T EXPERIMENT—BUY OUR SAND. Years of successful application to their various uses have proven they are unexcelled in quality and uniformity. We have all grades—Strong Silica, Sharp Silica, Lumberton, Albany, White Washed Silica, Fire Sand, Blast Sand, and Genuine Millville Gravel.

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PLUMBAGO FOUNDRY FACINGS.

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Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

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No. 4 Sandblast Barrel

Tilted Type - - - Five Sizes
SANDBLAST BARRELS

Ideally adapted for cleaning small work and extensively used for forgings, stampings, grey iron, brass, bronze and aluminum castings. Most intricate work can be cleaned successfully, as owing to the tilted position of the barrel, revolving at an incline, in connection with the conical bottom plate, the work is turned at such various angles that all parts and surfaces are exposed to the blast.

These mills can be had in five separate sizes, ranging from 14″ to 36″ in diameter, and from 16″ to 36″ in depth.

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We have received some complaints from subscribers to the effect that Canadian Foundryman is not being delivered. In almost every case investigation has shown that our friends have changed their addresses and have NOT notified us.

Let every subscriber look at the address on the label on this issue of Canadian Foundryman, and if it is not correct, please fill in and mail to us the following—

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HAGERSTOWN, Md. P. O. Box 8508

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Sand-Blast cleaned are worth more.

They machine faster with less tool expense and paint, plate or galvanize with a better and more lasting finish.

With the right equipment Sand-Blasting cleans them cheaper. "Pangborn" Sand-Blast Equipment meets every need and pocket-book.

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SCIENTIFIC METALLIC BLASTING ABRASIVE

Trade Mark

Adopt metallic abrasive instead of sand. Angular Grit will reduce your costs — one hundred pounds of grit will outlast five tons of sand. It cleans faster, requires less handling and less storage space, and reduces dust 80%. Write for samples.

Pittsburgh Crushed Steel Co. Sole Manufacturers

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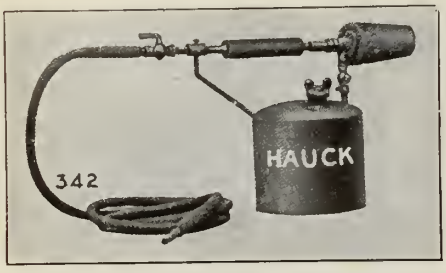
Ease and Speed in Heating



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The Hauck Compressed Air Suction Torch shown on the left lights instantly and produces an intense, powerful, clean flame. Needs no preheating and burns fuel or kerosene oil. Operates with compressed air at any pressure; absolutely safe. For brazing, preheating, etc.

Hauck Welded Steel Kerosene Torches

This type vaporizes any grade of kerosene or coal oil and produces an intense, steady, clean flame. Tank is all steel. Pump is quick-acting and of greater capacity than any other on the market.

Write for literature.

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Most reliable material for lining and patching Cupolas, Furnaces, Ladles, etc., saves time, labor and firebrick.

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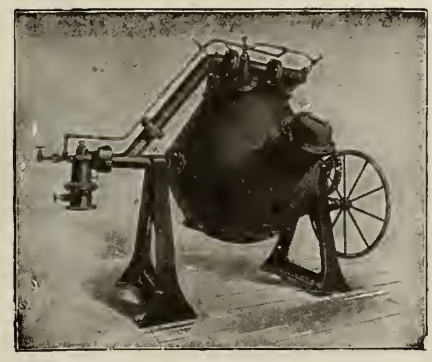
BETTER melts, in less time and at lower costs, are the results that go with Hawley - Schwartz Melting Furnaces. They are economy producers in every sense.



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THE Hawley - Schwartz heats uniformly and will handle all metal from 50 lbs. to 10,000 lbs.

Write for catalogue and complete information.

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Sand blast hose machine with screen hopper.

Better finished castings —lower costs

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A direct-pressure steel Sand Blast Tank is a practical, safe but inexpensive outfit.

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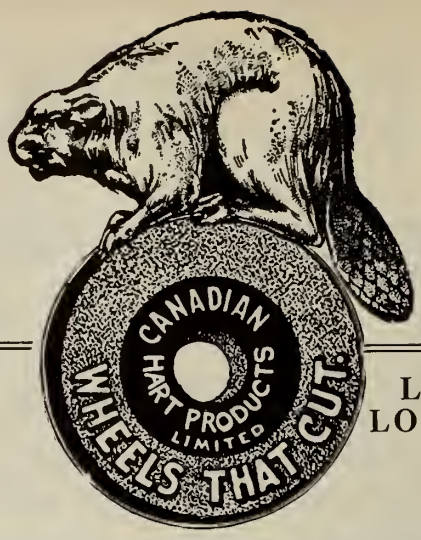

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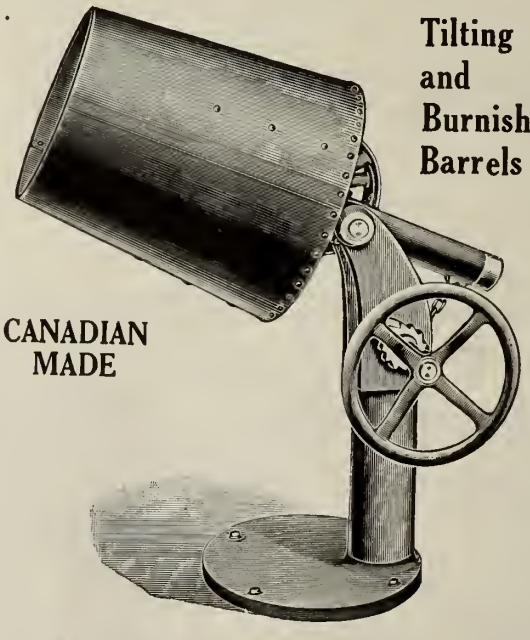

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Warm Air forced out by Fan
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"As you see, it consists of a series of steam coils compactly nested over a powerful fan-wheel, and enclosed in a sheet steel casing. Cold air at the floor level (or from outside) is drawn into the heater by the fan and forced up through and around the steam coils—after it is thus warmed, it is gently diffused through directing elbows out into the open building space."

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Baetz Patent HEATING SYSTEM

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Address .....

Building used for.....

We can / cannot use steam.

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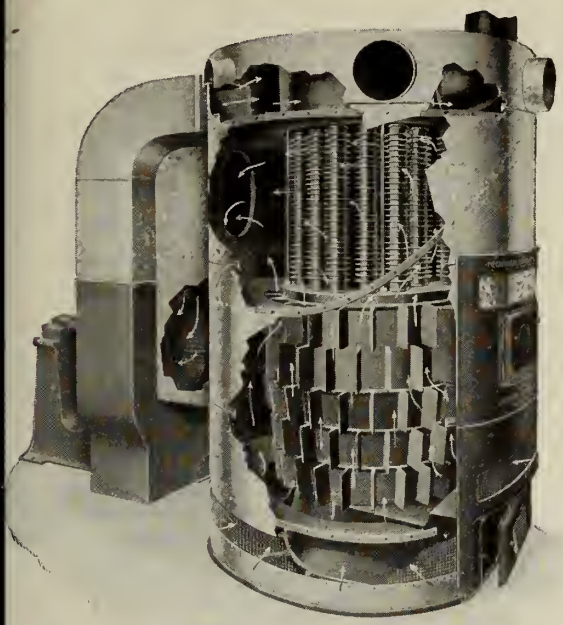

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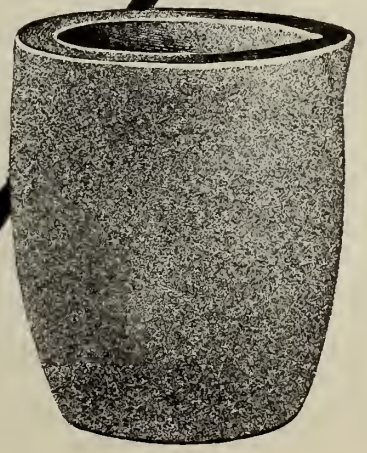

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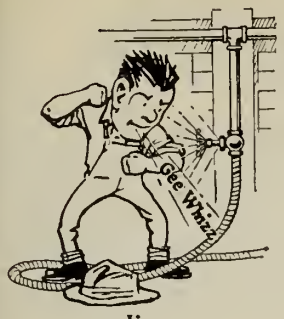

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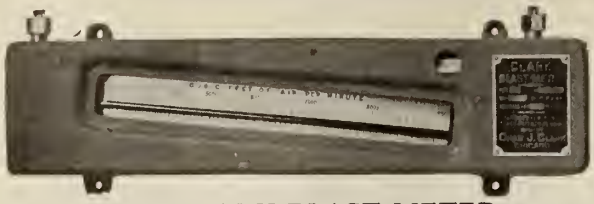


THE CLARK BLAST METER

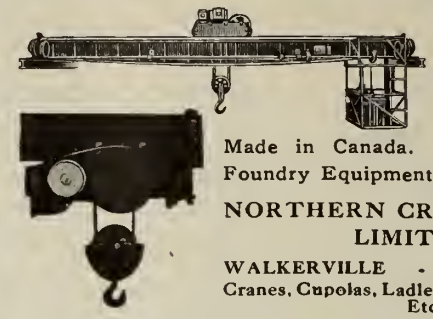
indicates the number of cubic feet of air or gas passing per minute.

The Meter is furnished in any capacity desired, each one built to order and guaranteed in every respect. Several hundred are in use in smelters, steel works, coke plants, etc.

Booklet cheerfully sent—write for it.

CHAS. J. CLARK BLAST METER CO.
Gladbrook, Iowa

CRANES



Don't buy a crane or hoist without investigating Northern Products—Made in Canada. Also a line of Foundry Equipment.

NORTHERN CRANE WORKS LIMITED
WALKERVILLE - - ONTARIO
Cranes, Cupolas, Ladles, Hoists, Tumblers Etc.

ANODES

Any style or shape
Quality Guaranteed

Why import your anodes when you can get guaranteed quality, quicker delivery, and can save duty and eliminate the annoyance of clearing at the customs by buying from us?

May we send you descriptive pamphlet and full particulars?

W. W. WELLS, Toronto

In Brass Bronze Copper Nickel Tin & Zinc

Patterns!

Phone Adelaide 5439

Put your pattern problems in our hands. Quality work and prompt service assured. Patterns made for all foundry purposes—wood and metal, models and aluminum plate work.

The A. J. HAMILTON PATTERN WORKS
120 Adelaide Street West, Toronto

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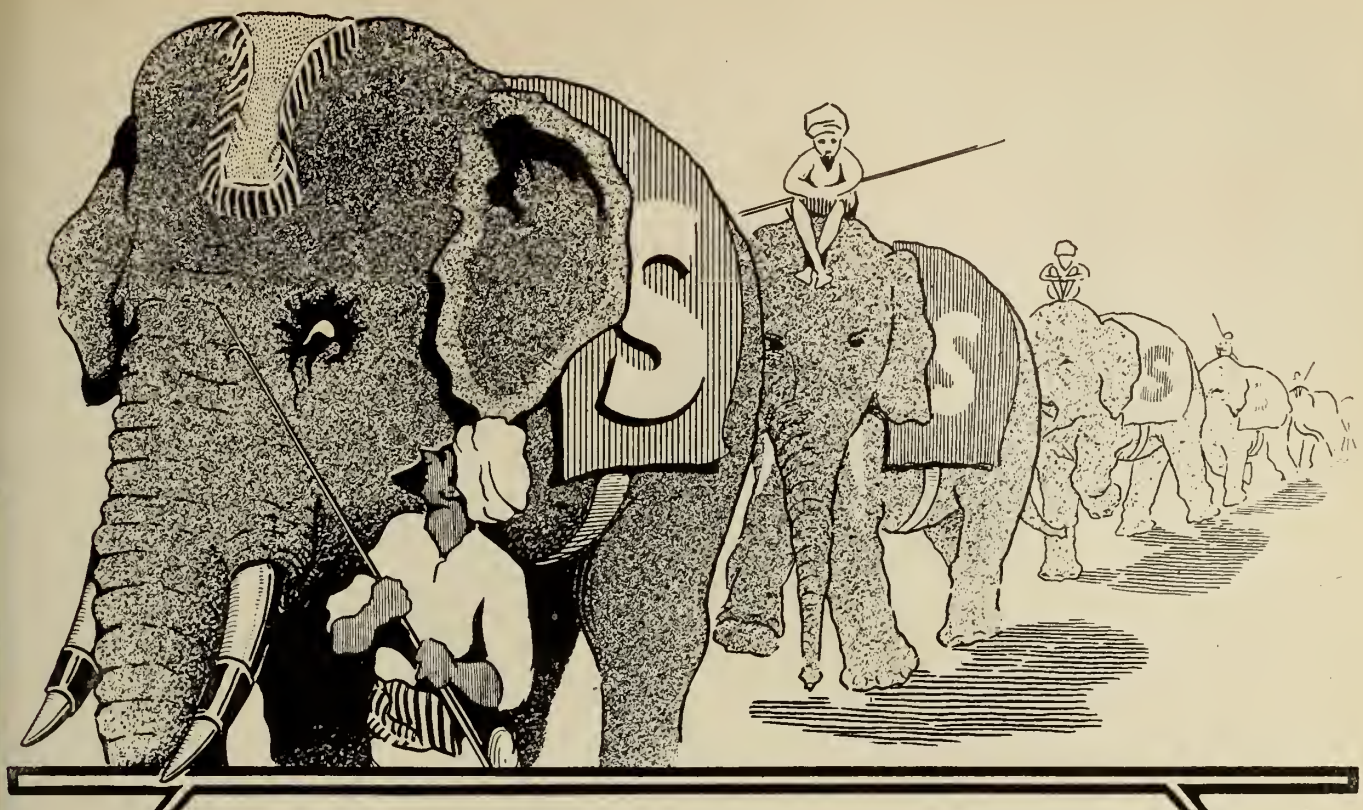


At the Front

The watchword of every human endeavor to-day is to increase the standard of efficiency.

Scientific management, advanced business methods, a broader spirit of brotherhood, and a substantial portion of common sense, are the elements that are being utilized toward this end.

It is in the recognition of this principle that I hope to make the Stevens plant one of the foremost exponents of the advanced efficiency methods in the community.

In grinding and bolting Plumbago, for instance, I have adopted methods by which I reach finer and more uniform grains and greater efficiency in practical use in the Foundry.

If often occurs in Foundry Practice that there is not the time, nor chance, to follow the old method of rubbing the Lead into the face of the mold; the shake-bag plan has to answer because it is quicker; but the Lead must be prepared as I prepare it to stick to the mold surface under this method.

When it fails to stay on the mold its efficiency is lost. My Lead stays on the mold.

I follow the same principle in the manufacture of all Foundry Facings and Foundry Supplies; in the making of Buffing Compositions and in the supply of equipment for the Plating Department.

There's a chance for improvement; for greater efficiency all around.

Old methods may be good methods, so they are followed until somebody wakes up and finds better ones.

To find better ones is the new Doctrine.

To "Keep at the Front" it is necessary to find the new ones.

If you are operating a Foundry or a Polishing and Plating Department, I have something more to say to you—will you write me a letter?

FREDERIC B. STEVENS

Manufacturer of Foundry, Electro-Plating and Polishing Supplies and Equipment; Cupola Blocks, Fire Brick and Clay

Corner of Third and Larned Streets, DETROIT, MICH.

Canadian Branch: WINDSOR, ONT.

The

PRESTON *Ball Bearing Electric Sand* RIDDLE

Do It Electrically

RIDDLING sand by electric power is cheap. The "Preston" Ball Bearing Electric Sand Riddle will save at least one dollar in wages every hour that it works! At the cost of one cent per hour it will sift sand as fast as a man can shovel it!

The Preston Electric Riddle approaches, more nearly than any other made, the action of a man riddling by hand. This is one of the reasons for its great success.

What We Think of Our Riddle

"Place it on trial for 10 days or 30 days in your plant alongside any other riddle made. At the end of the trial period we are satisfied to accept it back from you without any expense to yourselves if it hasn't proved its superiority over its competitor."

We would consider this a favor because we are interested in knowing whether it is or isn't the best riddle as we claim it is.

Note that the motor is totally enclosed, thus keeping it absolutely clean and free from the dust in the foundry. It is very necessary that an electric motor should be kept clean or its length of service will be materially shortened.

The Preston Woodworking Machinery Co., Limited

Preston, Ontario, Canada

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

Vol. XII | Publication Office, Toronto, June, 1921 | No. 6

WHITEHEAD'S ALBANY SAND

Established *in 1850*

We are the original producers and largest shippers from the Albany and North River Territory.

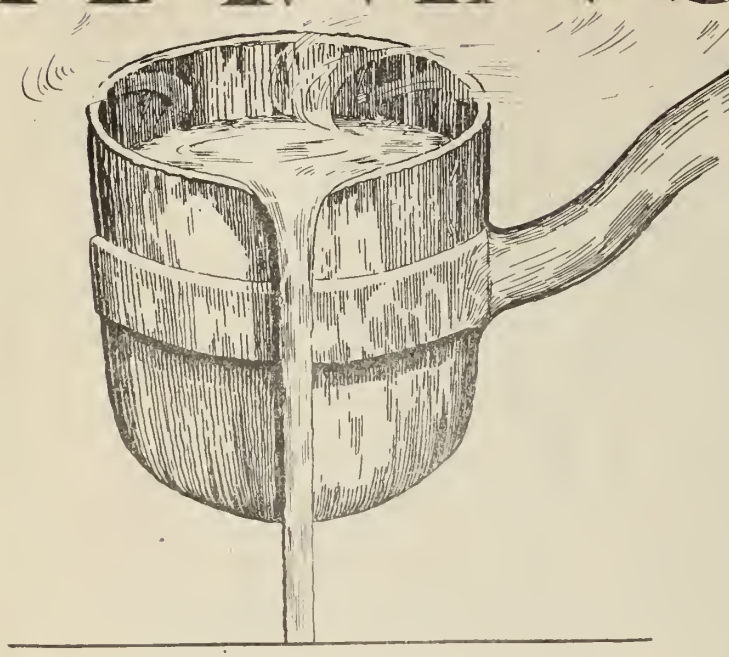
Over seventy years' experience in the selection, production and distribution of dependable moulding sands.

Write for "Albany Sand" Booklet

WHITEHEAD BROTHERS COMPANY

Providence **NEW YORK** **Buffalo**

KAWIN SERVICE



Consider your foundry as a ship— and Kawin as the pilot.

A ship when coming into port takes a pilot on board. The captain realizes that no matter how great is his seamanship he does not know the ports at which he calls as well as the pilot.

So with your foundry. A foundry owner, no matter how capable, can not know **all** the branches of his foundry practice as well as men who specialize—each in his own particular branch.

This is why Kawin Foundry Service has proved of such inestimable value to Canadian and American Foundrymen.

The Service consists of capable, highly trained men, each of whom has learned his own particular branch of foundry practice —both practical and theoretical—from the bottom to the top.

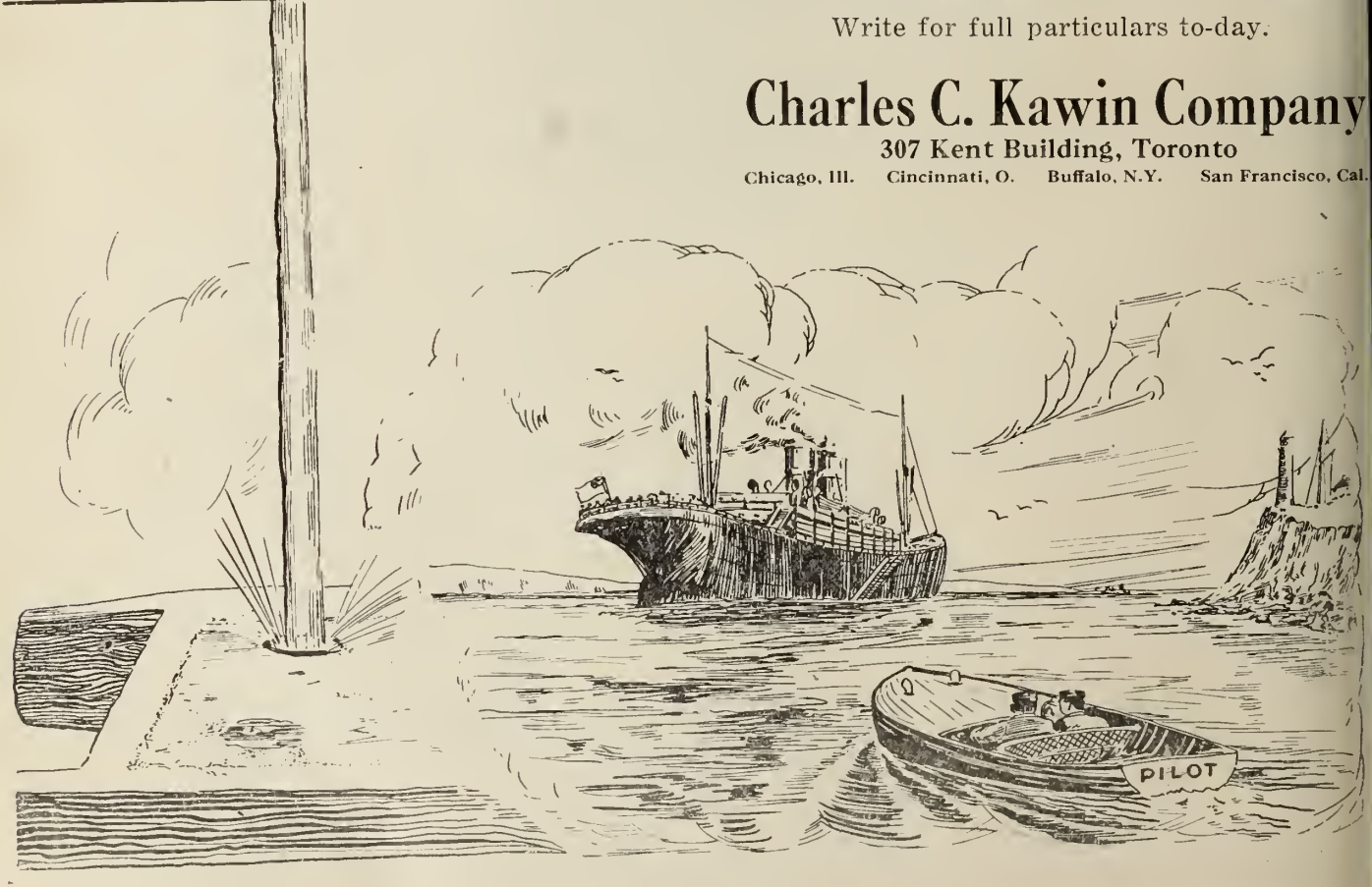
Because experience has proved just what Kawin Service can accomplish in a foundry, we are able to **guarantee that our service will save you at least 100% over and above its cost!**

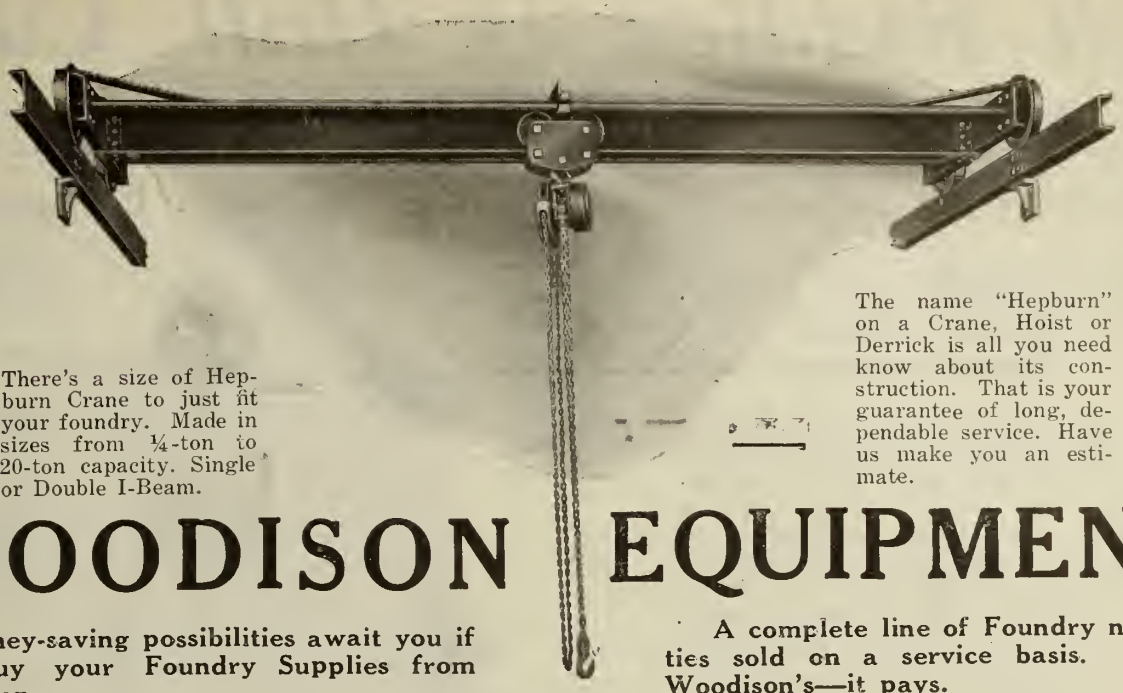
Write for full particulars to-day.

Charles C. Kawin Company

307 Kent Building, Toronto

Chicago, Ill. Cincinnati, O. Buffalo, N.Y. San Francisco, Cal.





There's a size of Hepburn Crane to just fit your foundry. Made in sizes from ¼-ton to 20-ton capacity. Single or Double I-Beam.

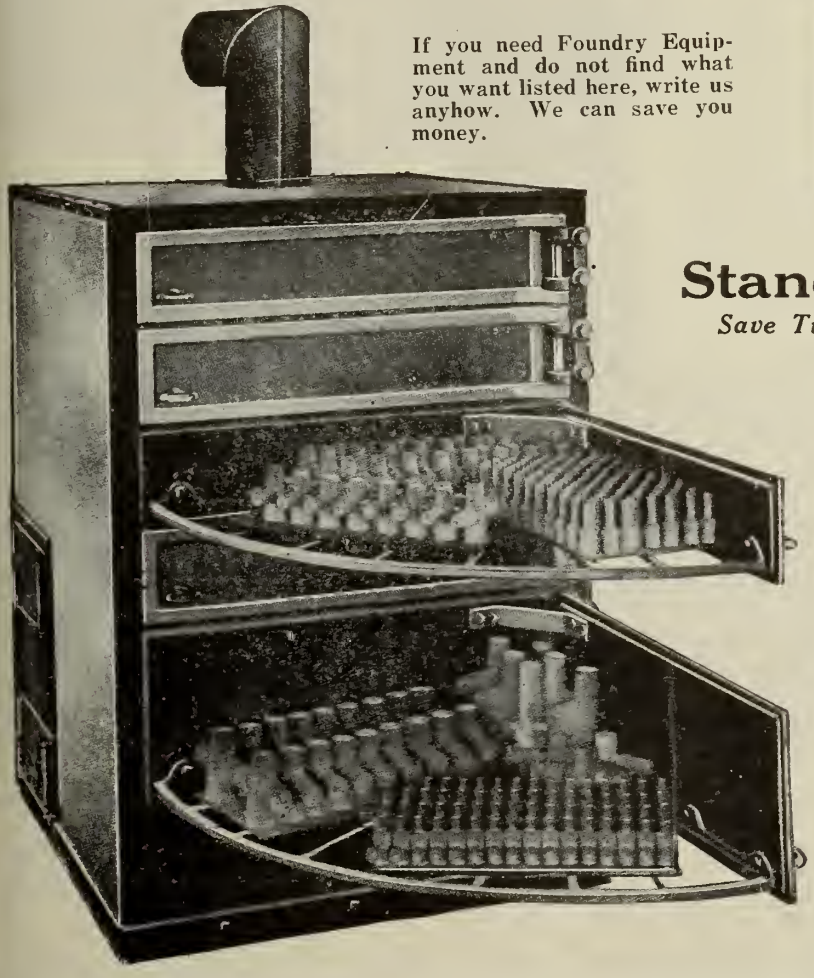
The name "Hepburn" on a Crane, Hoist or Derrick is all you need know about its construction. That is your guarantee of long, dependable service. Have us make you an estimate.

WOODISON EQUIPMENT

Money-saving possibilities await you if you buy your Foundry Supplies from Woodison.

A complete line of Foundry necessities sold on a service basis. Adopt Woodison's—it pays.

Figure out yourself just how many minutes in a day your men **waste** through lifting heavy castings by hand. A small, easily-operated Crane will put new efficiency on your Moulding Floor. We handle the HEPBURN line of Cranes, Hoists and Derricks. Hepburn Equipment will take the sag out of your economy curve in production.



If you need Foundry Equipment and do not find what you want listed here, write us anyhow. We can save you money.

FIRE BRICK
CUPOLA BLOCKS
FIRE CLAY
HEAT PROOF CEMENT
FOUNDRY FACINGS
FOUNDRY SUPPLIES

Standard Core Ovens

Save Time and Fuel on Small Work

By using our Standard Core Ovens for your small work you not only effect a great saving in time, but also insure a great saving in fuel.

The Standard is heated by gas, coke or coal without extra charge. Shelves are specially designed for small work and open or close without jarring. Baffle plate at the back of the shelf closes automatically, so that while the cores are being examined or changed the heat loss is reduced to a minimum. The Standard is made in other types besides the one shown. Write for further information and prices.

The E. J. Woodison

Company, Limited

Foundry Requisites, Fireclay, Firebrick and Equipment

Toronto, Ontario

Well Riddled is Half Cast!

COMBS GYRATORY RIDDLES

Sift More Sand—in Less Time—at Less Expense

The Combs Riddle sifts more sand because its true gyratory motion gives it double the capacity of any reciprocating machine of the same size. It does it in LESS time by attaining a high speed. It CUTS expense by demanding little power for operation and seldom requiring adjustments.

THE Combs Riddle is far in advance of any other type because its portability enables sand to be mixed just when and where needed. A man can easily carry it for it weighs but ninety pounds. When the plug is placed in a convenient socket it is ready to supply as many as twenty men with sand. Think of the time this one feature saves.

But the Combs Riddle MIXES as well as sifts sand. It is a producer of evenly mixed and tempered sand which insures a better mould with fewer patches. This is an important point to consider in choosing a Riddle.

The Combs Riddle is made in Toronto under Canadian Patents. It can be purchased with Canadian funds, thus eliminating any loss for "Exchange." For particulars and prices write direct to us.

This type of Riddle has many big features.

1. **The design is compact.**
2. **The frame is rigid and strong.**
3. **Only one bearing outside the motor.**
4. **Totally enclosed motor; all bearings dust-proof.**
5. **Gyratory motion is easier on r**
6. **There are no gears.**
7. **Easily adjustable sieve.**

This machine will screen more sand than ten labourers using hand riddles. There are no legs to get in the way of the shovel. A wheelbarrow can be run right under it.

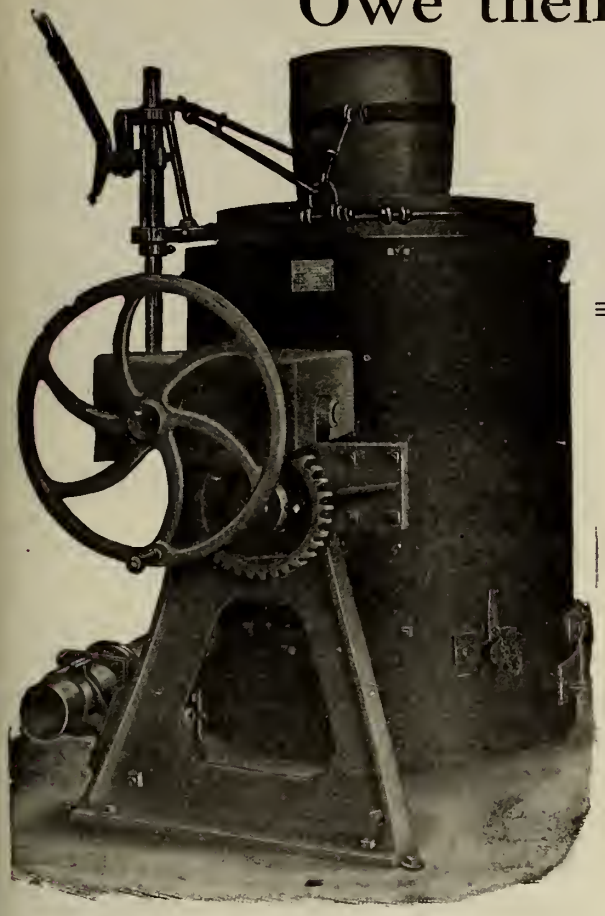
GREAT WESTERN MANUFACTURING CO.

LEAVENWORTH, KANSAS, U. S. A.

Monarch Melting Furnaces

Owe their Place of Leadership to one thing

They Save Time



Monarch Coke Tilting Crucible Melting Furnace.

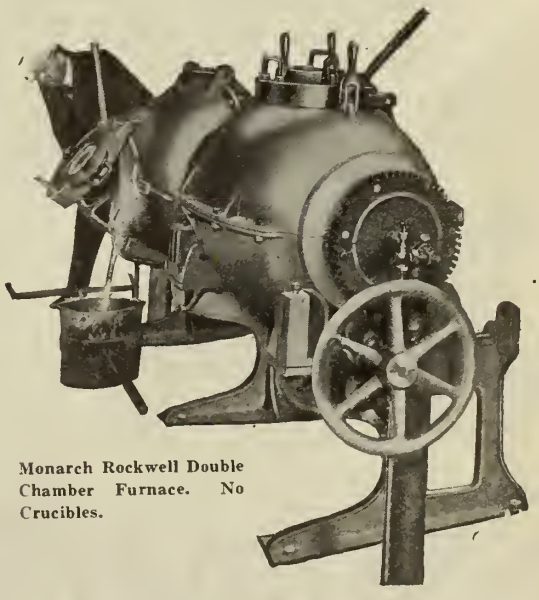
NOT so many years ago a foundryman would have been amazed if told a Furnace would melt with the speed and efficiency that Monarchs do to-day. And yet, right now in hundreds of shops, Monarch performance is accepted naturally —without question. Why? Because it's a sign of progress.

Here, then, is a point to consider carefully—progress. And when you look over your foundry to see just how progressive you are, remember this. Of the hundreds in use we do not know of one Monarch that has not brought its owner a radical drop in costs, in many instances as great as 50 per cent.

THE MONARCH
Double Chamber Furnace

Burning oil or gas melts almost twice as much metal as any other furnace without additional cost for fuel, because it utilizes all the heat from its one burner. While melting in one chamber exhaust heat brings the metal in the other chamber to the melting point.

The Monarch Coke Tilting Crucible Melting Furnace requires only a few shakes of the four upright bars after each heat. Above ground and built for various size crucibles.



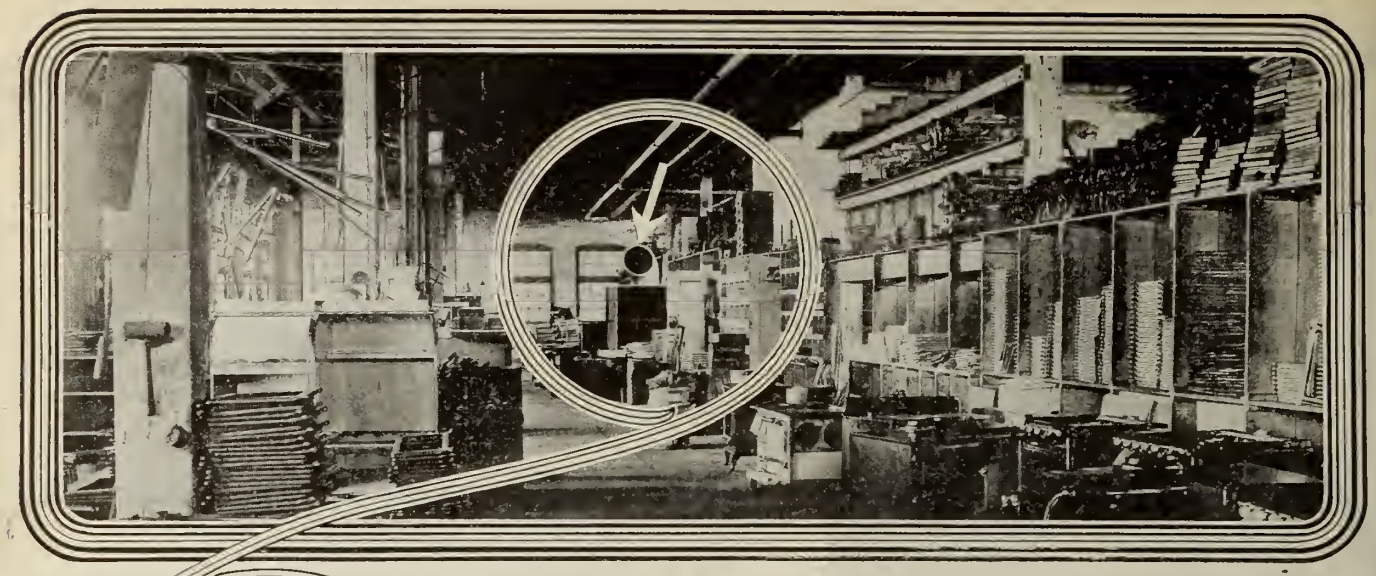
Monarch Rockwell Double Chamber Furnace. No Crucibles.

Our catalogue describes fully the complete line of Furnaces, Core Ovens, Mold Dryers and equipment. Write for a copy

The Monarch Engineering & Mfg. Co.

1206 American Bldg., Baltimore, Md.

SHOPS AT CURTIS BAY, MD.



Why Heat Your Foundry Only in Spots?

The Skinner Bros. (Baetz Patent) Heating System will heat all of the open space in your foundry all of the time—there will be no places continually too warm while others are too cold, as is usually the case with old-time heating systems. Under these conditions sand does not freeze and your foundry is quickly reheated when monitor windows are closed after pouring.

Simple and Economical

Skinner Bros. (Baetz Patent) Heaters operate without outside pipes or ducts—they are portable and require no special foundation—cost of installation is 15 to 50% less than any other system with operating cost equally low. The mild, constant circulation of warm air supplied by this heater does not cause drafts or air blasts, floor dust is not disturbed, nor other conditions established which are injurious to the health of employees.

Get Further Details

The principle of operation of the Skinner Bros. (Baetz Patent) Heater is briefly described at the left. Performance is guaranteed on a strictly money refund basis. Complete detailed information and list of users will be sent on request. Please use the coupon.

Mechanical Details

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a powerful fan-wheel. Coils are heated by exhaust or live steam. Cold air is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, is diffused through outlet hoods to every part of the open area. No pipes or ducts used. The fan is operated by any power available.

Direct-Fired Type

Where steam is not available, we supply our direct-fired type DF, which burns coal, coke or wood. Built on the same scientific principle as type SC. The fan is operated by any power available.

Skinner Bros. Mfg. Co., Inc.

1436 South Vandeventer Ave. St. Louis, Mo.

Boston .....447 Little Bldg.	Chicago .....1506 Fisher Bldg.
Buffalo .....704 Morgan Bldg.	Indianapolis.....228 Occidental Bldg.
Cleveland .....614 Marshall Bldg.	New York .....1704 Flatiron Bldg.
Minneapolis..804 Metropolitan Life Bldg.	

Skinner Bros.
Baetz Patent HEATING SYSTEM

Skinner Bros. Mfg. Co., Inc.
1436 S. Vandeventer Avenue, St. Louis, Mo.

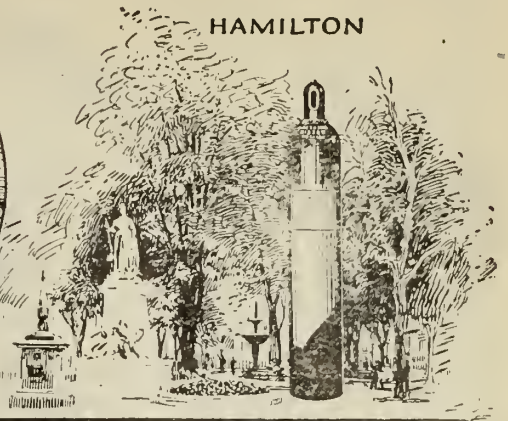
Please send complete details on Skinner Bros. (Baetz Patent) Heaters to

Firm .....

Address .....

Building used for.....

We can / cannot use steam.



Dominion Oxygen—

The Route Finder.

AN order placed with the Dominion Oxygen Company Limited, means an order filled on time and delivered on time.

When the ordinary routes of transportation are blocked—when strikes and storms and tie-ups conspire to defeat prompt deliveries—there is always a way open to Dominion Oxygen. Whether it reaches the consumer by trolley, by water or by motor truck—whatever the routing and whatever the added expense — the promises of the Dominion Oxygen Company Limited are fulfilled.

We call your attention—pridefully—to such Service as part and parcel of our system, where all energies are bent to the end of a perfected product backed by a policy of deliveries that is equal to any emergency.

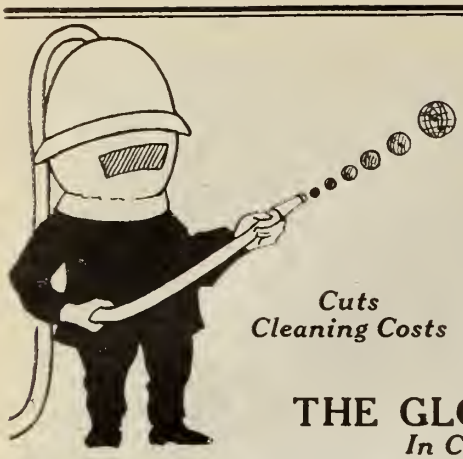
Our expansion program for 1921 has now reached the point where six centrally located distributing stations at Toronto, Hamilton, Montreal, Welland, Merritton and Windsor are in full operation. Thus we are enabled to fill your order with oxygen of the highest purity on the day it is received and to make deliveries of any quantity, anywhere and whenever needed.

DOMINION OXYGEN COMPANY LIMITED

Hillcrest Park, Toronto

Hamilton, Montreal, Welland, Windsor, Merritton

D-18



Cuts Cleaning Costs

The Effective Enduring Abrasive

It's the impact in blasting that does the work. **Sand** under impact crushes quickly and pulverizes to dust. It must be replaced by **new** sand frequently. Globe Chilled Shot can be used 250 to 275 times before it becomes ineffective. It reduces storage bins; eliminates sand driers; reduces labor costs.

Send for samples.

GLOBE
CHILLED SHOT

It gives you a better and quicker Blasting Job at a reduced cost.

THE GLOBE STEEL COMPANY, Mansfield, Ohio, U.S.A.
In Canada: Canadian Johns-Manville Company, Asbestos, P.Q.

"VOLTA"
Electric Furnaces

ELECTRIC STEEL FURNACES
100 lbs. to 15 tons Capacity

GRAY IRON CASTINGS
Electric Furnaces for making Gray Iron

ELECTRIC BRASS FURNACES
Made in standard sizes of ⅛, ¼, ½ and 1 ton capacity.

Electric Furnace Accessories of All Kinds

In order to meet and overcome strong competition you should reduce your production costs as well as metal losses. This can unquestionably be done by operating an electric furnace. Let us convince you that this is true.

The Volta Manufacturing Company, Ltd.
WELLAND, ONT.

FOUNDRY PRODUCTION

WE DESIGN

Industrial Plants
Power Plants
Foundries
Machine Shops
Bridges
Hospitals
Banks
Public Buildings

AND MAKE

Reports
Estimates
Appraisals

Adequate foundry facilities, ample floor space, proper ventilation and lighting are features in foundry design, which, in connection with operating efficiency, will insure maximum production.

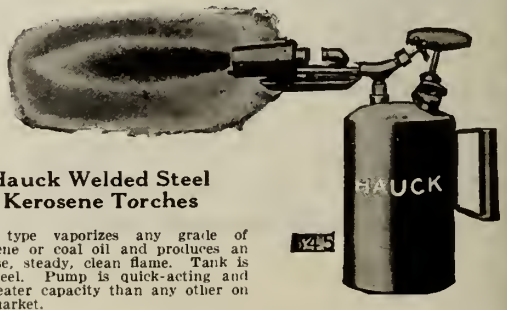
It will pay you to consult us on your foundry problems.

The Osborn Engineering Co.
CIVIL, MECHANICAL, ARCHITECTURAL ENGINEERS
2848 PROSPECT AVE. CLEVELAND, O.

HAUCK BURNERS
Ease and Speed in Heating

Will Heat a 4-inch Shaft in Five Minutes

The Hauck Compressed Air Suction Torch shown on the left lights instantly and produces an intense, powerful, clean flame. Needs no preheating and burns fuel or kerosene oil. Operates with compressed air at any pressure; absolutely safe. For brazing, preheating, etc.

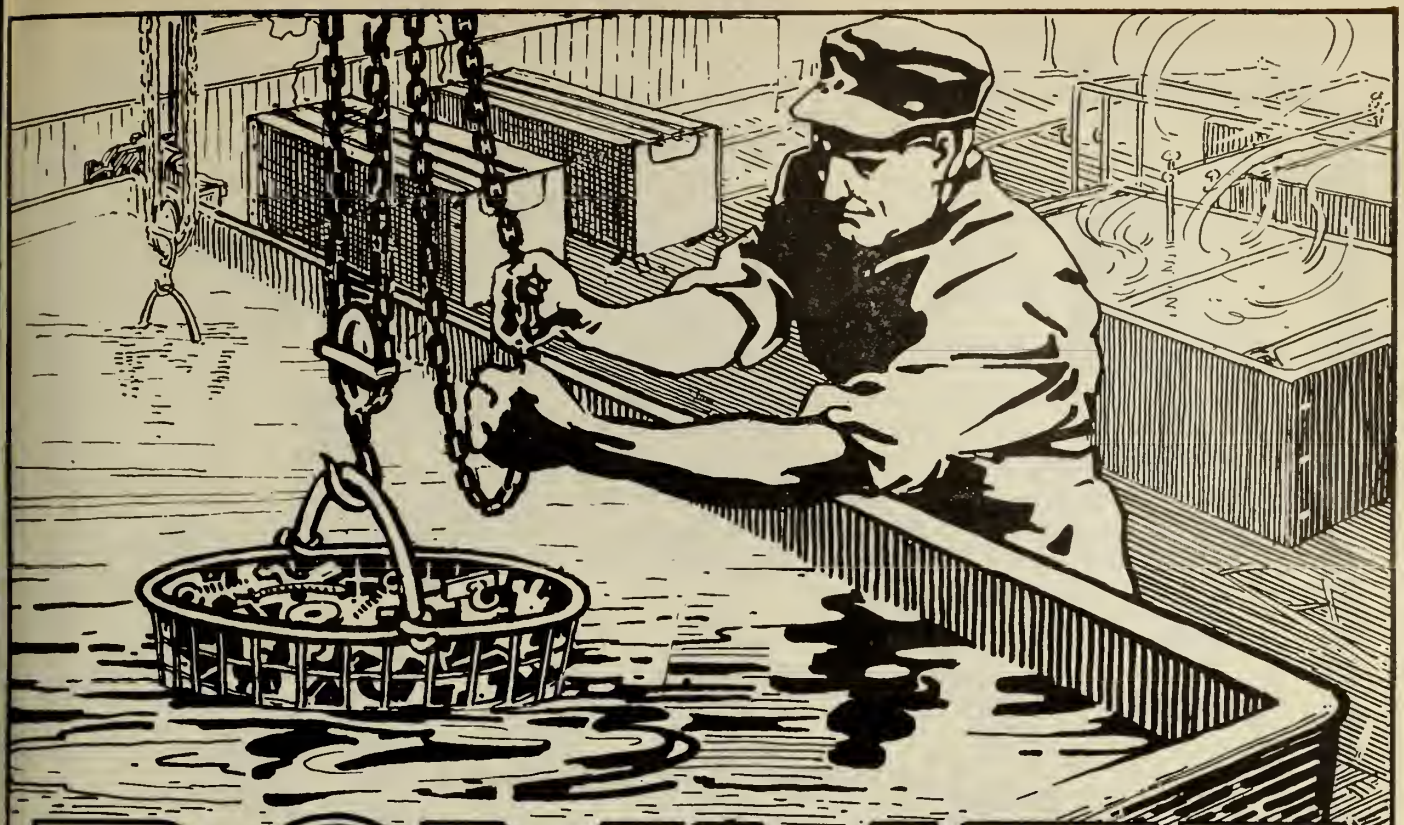


Hauck Welded Steel Kerosene Torches

This type vaporizes any grade of kerosene or coal oil and produces an intense, steady, clean flame. Tank is all steel. Pump is quick-acting and of greater capacity than any other on the market.

Write for literature.

CANADIAN HAUCK BURNER CO., LIMITED
PORT HOPE, ONT.



ROYLITE
CLEANER

A New Discovery!

ROYLITE Cleaner represents the very latest and most successful development in the process of chemically removing oil, grease, enamel, paint or any kind of dirt from metal in the quickest and most thorough manner.

Formerly most cleaning solutions consisted of caustic soda, potash or lye which saponified grease and acted like a soap. The alkali strength was quickly used up because the action caused a precipitate and heavy sediment formed at bottom of solution.

The new Roylite process emulsifies mineral oil and heavy greases which cannot be saponified, by lifting them from the work to top of solution, thereby avoiding the precipitate action, making it unnecessary to throw out solution but merely add small quantities to sustain its strength.

Guaranteed not to discolor or tarnish the brightest surface.

Our men will gladly give you demonstrations. Order a barrel to-day on approval.

Lasts longer — Works quicker — Costs less

Manufactured by

CANADIAN HANSON & VAN WINKLE CO. LTD.

TORONTO, ONTARIO

"MADE IN CANADA"

CLEANS ALL METALS

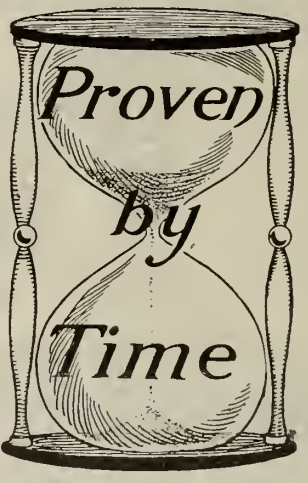
GEO. F. PETTINOS
FOUNDRY SUPPLIES
PHILADELPHIA

SAND

DON'T EXPERIMENT—BUY OUR SAND. Years of successful application to their various uses have proven they are unexcelled in quality and uniformity. We have all grades—Strong Silica, Sharp Silica, Lumberton, Albany, White Washed Silica, Fire Sand, Blast Sand, and Genuine Millville Gravel.

Also

PLUMBAGO FOUNDRY FACINGS.



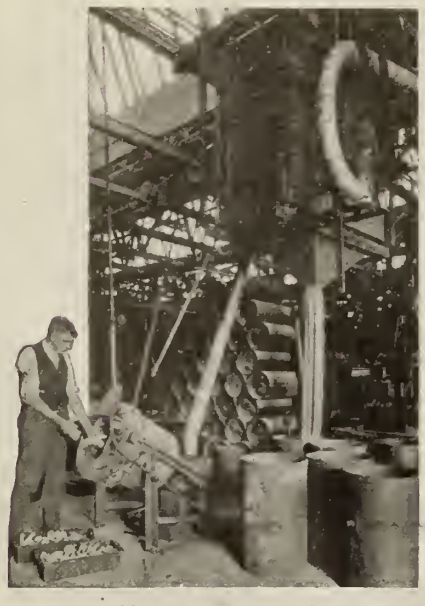
George F. Pettinos

Real Estate Trust Building - Philadelphia, Pa.

Send your orders and inquiries to our

Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

SLY SAND BLAST EQUIPMENT "UP - TO - DATE"



No. 4 Sandblast Barrel

Tilted Type - - - Five Sizes
SANDBLAST BARRELS

Ideally adapted for cleaning small work and extensively used for forgings, stampings, grey iron, brass, bronze and aluminum castings. Most intricate work can be cleaned successfully, as owing to the tilted position of the barrel, revolving at an incline, in connection with the conical bottom plate, the work is turned at such various angles that all parts and surfaces are exposed to the blast.

These mills can be had in five separate sizes, ranging from 14″ to 36″ in diameter, and from 16″ to 36″ in depth.

The W. W. SLY Mfg. Co.

Main Office and Works:
Cleveland, Ohio

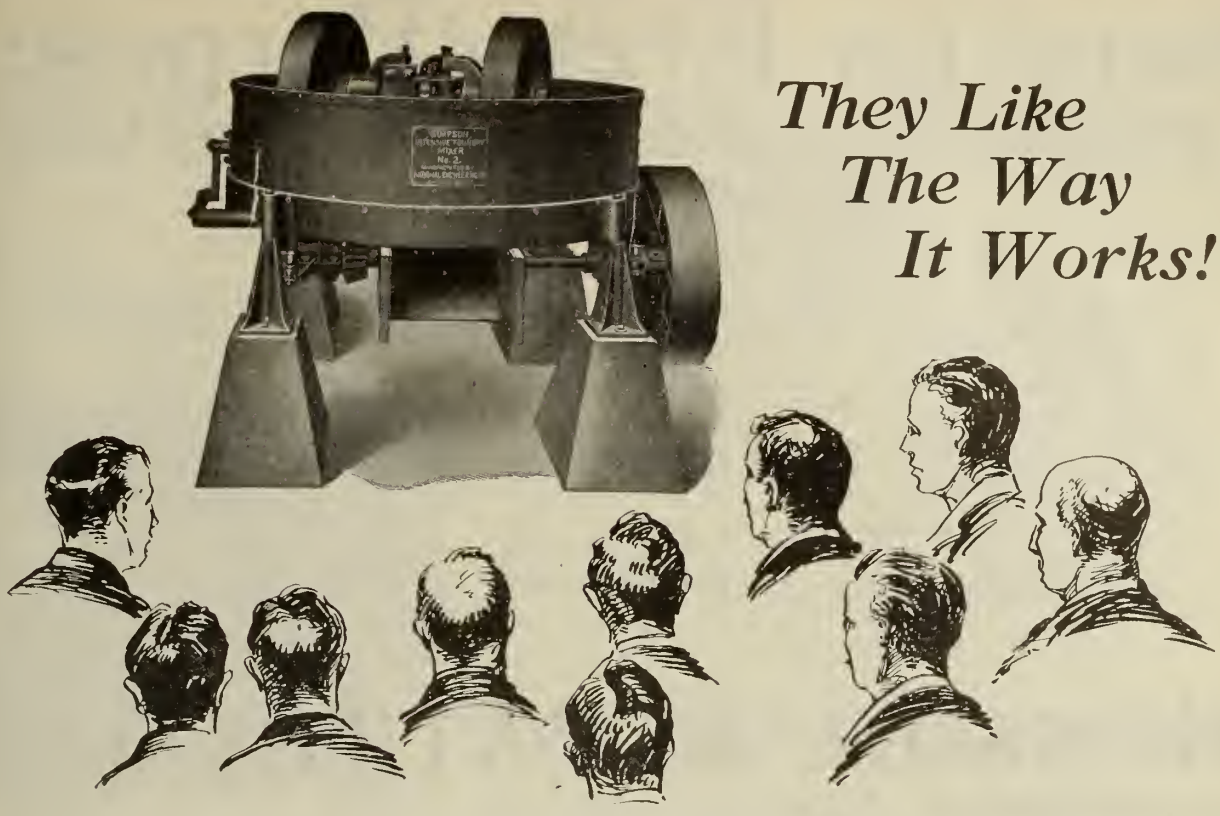
New York
Washington
Birmingham
Paris, France

Chicago
Detroit
St. Louis
Los Angeles

Representatives for Quebec and Maritime Provinces:
Williams & Wilson Limited, Montreal, Que.

The SLY Line of up-to-date Foundry Equipment

Steel Tumbling Mills
Iron Cinder Mills
Brass Cinder Mills
Resin Mills
Sand Blast Mills
Sand Blast Mills—Tilted
Exhaust Fans
Sand Blast Rooms and Blast Cabinet
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers



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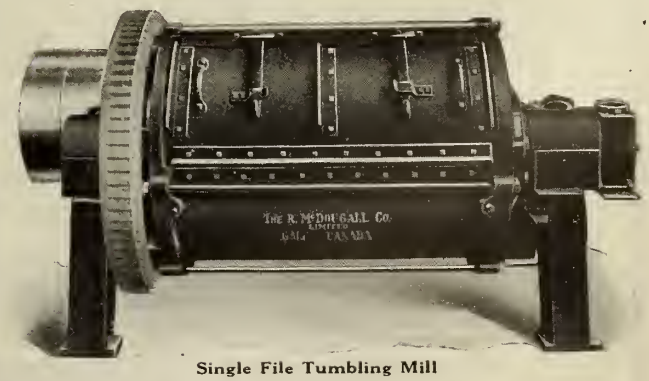

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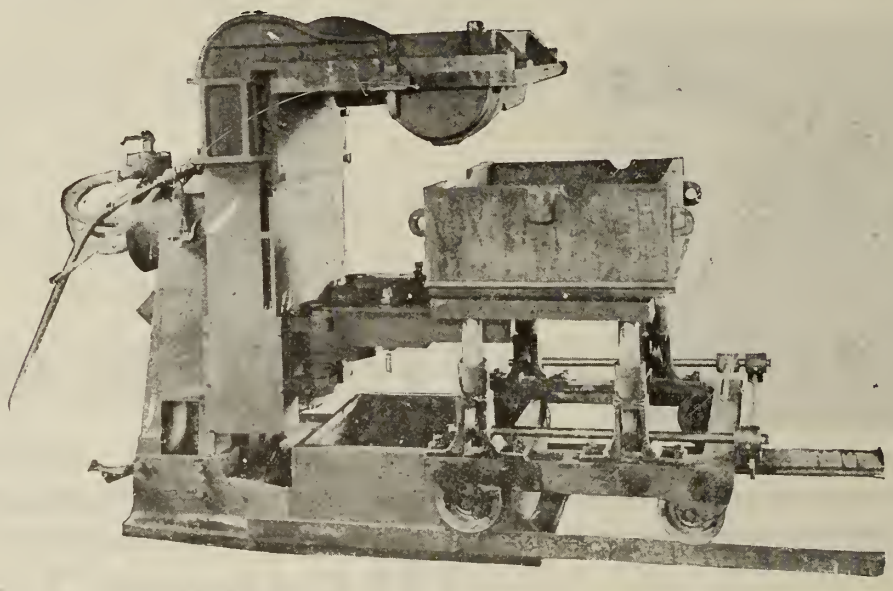

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We would be glad to show you how the Grimes can cut your costs and boost production on your work. Write for catalogue and full details.

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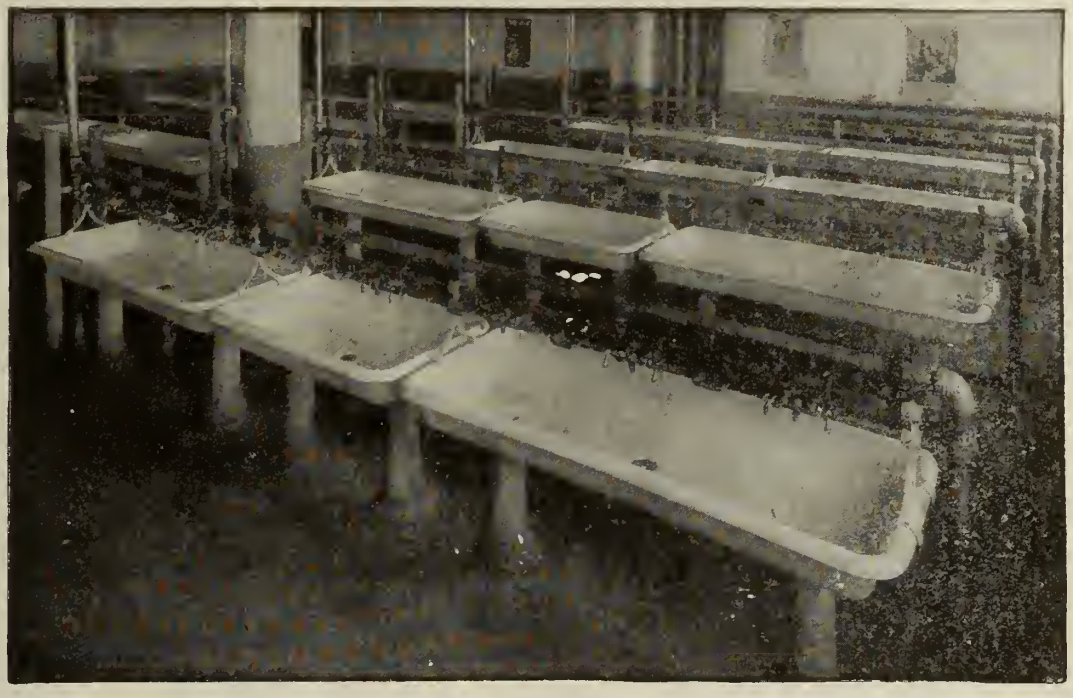

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22

Sterling

Foundry Specialties
Are
Foundry Necessities

Ancient

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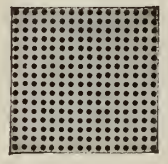

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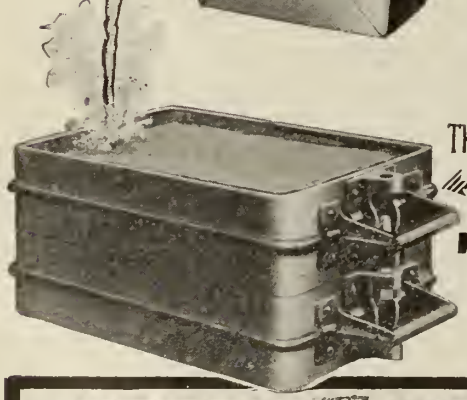
The use of specialties that are correctly designed and made and kept in stock for instant use. Sterling is such a line—why not stock up now and profit by the modern way?



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To-day, with so many labor-saving devices constantly appearing on the market, the purchaser of new equipment should ask carefully—

WHAT—

Does It Save and HOW MUCH?

In investigating **this** well-built machine the foundryman finds a combination of desirable features that mean two things—Larger Production and Lower Costs. He finds Sand-lifting Time Saved, Wages Saved, Power Saved, and Repair Bills Saved by using the

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Ball-Bearing Electric Sand Riddle

The "Preston" will riddle sand as fast as a man can shovel it in, and all it costs is a cent an hour. This decided economy is made possible by the ball-bearing, smoothly running design, which seldom calls for attention.

The "Preston" is strong and durable, and a glance will show how simple its construction is. Light in weight it can readily be transported to any part of the foundry and with a twist of the plug is ready for a hard day's work.

Riddling sand by electric power is cheap—when you use a "Preston." The Preston is a Canadian-made machine, and merits your close inspection. The form below is for your use.

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The Preston Woodworking Machinery Co., Limited.
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Gentlemen: Please ship me/us one "Preston" for.....cycle.....volt current. At the end of the above trial period I am/We are privileged to return the riddle if not satisfied in every way.

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Ball Bearing Electric Sand Riddle

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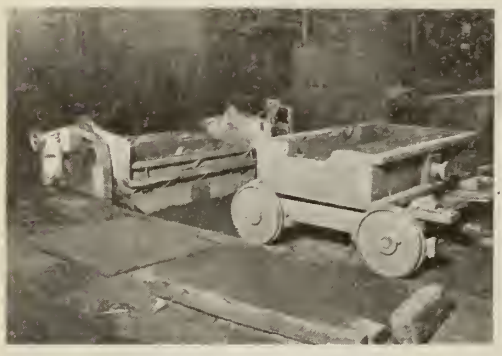
OSBORN

Machine Tool Castings



Osborn Roll-Over Jolt Machines

Made Regularly in the Following Sizes:

	Maximum Flask	Over-all Capacity
No. 400		24″ x 24″
No. 402		36″ x 36″
No. 403		40″ x 44″
No. 403W		40″ x 52″
No. 404		52″ x 54″
No. 405		60″ x 64″
No. 406		60″ x 78″
No. 407		65″ x 92″

The Modern Foundry Co., Oakley (Cincinnati), Ohio, are makers of high grade machine tool castings. The above floor of moulds shows the class of work being turned out on Osborn Direct Draw Roll-Over Jolt machines. This is one of the best equipped foundries in the country for making high grade machine tool castings such as are required for The Cincinnati Milling Machine Co.

The insert shows a No. 406 Osborn Direct Draw Roll-Over Jolt machine with pattern mounted and a completed mould on the run-out car.

This plant is using nine Osborn machines of the following sizes: No. 404-405-406-407—all being Direct Draw Roll-Over Jolt machines. Both moulds and cores are made on this installation of machines.

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1. Insure rapid production.
2. Lower direct moulding cost.
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4. Effect saving in metal.
5. Lower overhead per ton.
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CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Member of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

Oil Coming into More Prominence in the Foundry

Oil as a Fuel in the Foundry Will Gain in Popularity as it Becomes Cheaper and More Plentiful Than Other Fuels

By F. H. BELL

OIL is a substance, the name of which has very little meaning unless accompaned by some adjective to lend it a meaning by throwing light on the brand of oil under discussion. The different brands of material which come under this general head are so numerous that volumes would be required to enumerate them, let alone describe them.

The variety of brands required in the foundry is, of course, considerably limited, but still the word "oil" does not cover the ground in the foundry.

The term oil is generally applied to all neutral fatty substances which are liquid at ordinary temperatures. The many of the volatile mineral oils, and oils of vegetable origin, are simply compounds of carbon and hydrogen, portion of vegetable but the larger pro- and animal oils contains oxygen in addition, whilst a few also contain nitrogen and sulphur, as in oil of mustard. The vegetable and animal oils containing oxygen are mostly glycerides of fatty acid, and are characterised by being insoluble in water, slightly soluble in alcohol, but readily soluble in ether. From this description it will be seen that most oil is composed of ingredients which are familiar to the foundryman. In the foundry, oil is used in core work and to some extent in the moulding but the oil which I propose to dwell upon on this occasion is that which is used as a fuel in melting non-ferrous metal, drying cores, heating ladles, etc. This oil is known as petroleum but is frequently spoken of as crude oil. The word crude is attached to it because it is the raw material from which coal oil, benzine, naptha, gasoline, vaseline, etc., are procured.

It would, no doubt be of interest to the reader if we should go a little way into the details of refining the crude oil so as to secure the different commodities just mentioned, but as this is not our subject we cannot spend much effort on it. It will be necessary however to spend some time on this feature in order that the reader will more readily understand how and why this material, sometimes spoken of in an irreverent manner as blackstrap can be made to work the wonders which it does.

When we look at the gasoline which is used to drive an automobile or an aeroplane and then look at the crude petroleum we do not see much resemblance, yet we know that the finest of gasoline, or petrol as it is being called nowadays is contained in that blackstrap oil and all that it wants is a chance to escape and it will do its work just as readily as though it had been put through a refining process.

Crude petroleum is undoubtedly the result of decaying vegetation and if allowed a few more millions of years to complete the process it would undoubtedly be coal. As it is it might be considered as a sort of liquid coal, hence the name "coal oil" which would seem to be very appropriate. At the gas plants where illuminating gas is produced from coal, crude petroleum is used in conjunction with the coal and makes its share of the gas. At the oil refineries where the petroleum is disintegrated into its various component. It is subjected

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Description of their foundry illustrating lay-out of pipes and the mode of burning oil.

Another New Up-to-date Canadian Foundry 20
The new plant of the Grinnell Co. is so sytematised that it is a veritable machine itself.

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Repairing a broken roll casting by burning. Want information on Tuyeres. Does blast go to centre of cupola?

Patterns and Casting. Some old time Articles 24
Showing some interesting samples of work done by the ancients, comparing favorably with that of modern times.

And many other articles.

pends on the weight of each component. It is subjected to gradual heating, and the vapors given off under the distinct variations of increasing temperature are condensed and further refined. This process is technically known as fractionization. Crude petroleum heated in a still, first gives off its lighter oils, those which evaporate at low temperature. As the temperature is raised, heavier substances are turned into vapor, and so on, until finally only coke remains as a residue in the bottom of the still. Each of the vapors is condensed separately and constitutes one or another of the commodities formerly mentioned. If the crude oil

STRIKING A GUSHER AT FORT NORMAN.

is properly mixed with air it forms a vapor which contains all the combustible matter contained in the various constituents. In the short article on the new installations at the James Morrison Brass Works this will be described more thoroughly.

Where Do We Get The Oil

Now come the two points—what advantage can there be in burning oil, and where can we get it? In Canada we have what it is predicted will be among the best oil deposits in the world. As a matter of fact it is no longer a prediction but a known fact. Oil experts (not our own, but our neighbor's) settled it in their minds some time ago that we had the goods. They did not say "If." They said "When." When they began to bore in northern Canada they talked of what they would do "when we strike oil" and not "if we strike it." Agnes C. Laut, in her interesting article on "Canada Revisited" in "MacLean's" puts it thus:—"Canada has the oil. Canada holds the naval and merchant marine key of America. Edmonton in our generation will be a second Pittsburgh. Great tankers will float out from Prince Rupert to suply the Orient. Tank cars will become as common across the prairies as to supply the Orient. Tank cars will become oil burners at a saving of three to one in wages and fuel, and will not set fire to adjoining forests with sparks from lignite and bituminous coal. To ten million fuel users in the Middle Western States the cost of fuel and light fell from $200 and $300 a year to $35 a year after the discovery and utilization of fuel and oils and gases through community pipe lines. If you want to know the details of this, write to Dr. McDowell, of Pittsburgh, or the Bureau of Standards, Washington. They will send you a graph that will look quite incredible to fuel users on our prairies now paying $20 a ton for coal."

Unlike the Mexican fields where the drilling had to be done in jungles where the tropical climate was impregnated with disease that the men died like flies, and unlike the South American fields where the oil had to be transported over a mountain range she says: "With oil in the North, you have the oil for engine power to haul the tank cars out; and building railroads in the North on a tie bed that is adamant frozen rock seven months a year is an easy proposition compared to building switchbacks up 10,000 feet of mountains in South America and down 10,000 feet of mountains to the sea. Storage isn't going to be such an expensive thing in the North, nor haulage either. Arctic tankers will do the job in the summer, while rail haul over the frozen road-beds will be the order in the winter. Alberta can laugh now at her heavy municipal and provincial indebtedness." The men who thought they were "broke" putting in Northern Railroads that began somewhere and ended nowhere, will find they are not "broke," only "bent."

If all this is true why won't our North boom ahead at express train speed? She then proceeds to point out some improvements which might be made in our laws to encourage the development of our mineral resources. However, wells have been bored in the far north district of Canada with the most satisfactory results. Not only good wells but "Gushers" have been struck, and Canada is assured of an abundance of oil for light, heat and power.

Let the railroad and steamship and aeroplane companies do as they will, our concern is for foundry and what use will be made of this oil in the foundry field. Crude oil has been used for fuel in the foundry for a number of years but it is not any too well known to the average foundryman. The blow torch for drying molds and ladles as well as for lighting the cupola has already been described in these columns, and a few points on the method of using it for melting non-ferrous metals will be of interest.

FINDING DIAGONALS

In the last issue of Canadian Foundryman there apeared an article entitled "Laying Out a Hexagon," in which it said that if the diameter of the flats is known, the diameter of the piece required to lay out the hexagon could be found by multiplying the diameter of the flats by 1.156. This reminds us that the issue of June, 1920, included this along with some other rules, under the heading "To Find the Diagonal of Hexagons, Octagons and squares." To find the diagonal of a hexagon multiply the diameter by 1.1575, of an octagon by 1.0825; of a square by 1.4129. The diagonal is, of course, the diameter of the smallest circle in which the hexagon, octagon or square can be laid out.

THE LOG SHACK WHERE THE IMPERIAL OIL CREW WINTERED DURING THE SEASON OF 1919-20.

James Morrison Co. Adopt Oil-burning Furnaces

Three Oil-burning Furnaces Take the Place of Thirteen Coke Furnaces

AS an example of how oil is used in the brass foundry we will cite the recent alterations at the works of the James Morrison Brass Co., Toronto. This is one of Canada's oldest institutions, having been established in the year 1864 by Mr. James Morrison, who still survives and who continues to attend regularly to his duties at the works, being president and general manager of the company.

The output of this plant conists mainly of marine and engineering brass goods. Much of this work is light and the metal, of necessity, must be sound and of good appearance, and incidently must be poured hot enough to run into the light and complicated castings which are required in this line of goods.

The foundry, like most of the well-equipped brass foundries of the old school had a basement under it, and along one side was a row of 13 coke-burning pit furnaces, which projected down from the floor level into the basement. These did the very best of work and produced first-class casting, but they had their disadvantages. In order to get any kind of a day's output, it was necessary to have a number of men to go a couple of hours ahead of time in the morning to clean the ashes and cinders out of the furnaces and get the fires started. The furnaces being built into the floor, of course, were cleaned out from the basement, which made it as handy as could be, with a coke furnace, but about three heats per day would be the limit from each furnace, and to keep this battery of furnaces in operation kept quite a number of men busy all day long, carrying up coke and poking the fires. This, added to the work of removing the ashes from the basement, made the daily programme for quite a staff of hands.

A few months ago it was decided to change over to oil, and the 13 coke furnaces were removed and three oil furnaces were put in their place. These oil furnaces are also pit furnaces and the brass is melted in crucibles the same as before, but the oil takes the place of the coke. One man does all the work and he begins his day with the molders. Each furnace is good for from eight to ten heats per day, so when the three furnaces are running full blast an enormous amount of metal can be melted.

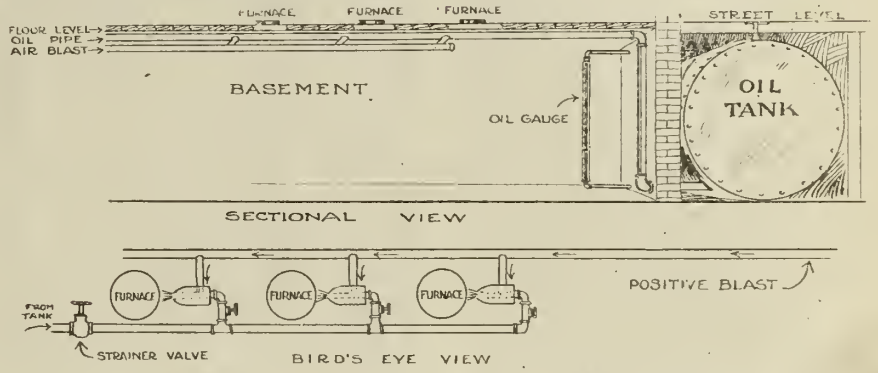
A sketch, showing the lay-out of the installations, will be of interest to those who contemplate this method of melting their metal.

In the illustration will be seen a layout of the basement. Under the concrete sidewalk is the oil tank, 5 feet in diameter and 14 feet in length. Placing the oil tank outside was not necessary, but was done to satisfy a feeling of safety. A permit was received from the city authorities to build a concrete vault in front of the foundry, but in such a way that it would not in any way interfere with traffic. The concrete sidewalk is built right over it, hiding it from view.

There is no possible danger from having a tank of crude oil about the place, other than the fact that if the plant took fire from some other cause, it would be some satisfaction to know that this storage of combustible material was in a safe place.

This tank is airtight and is connected up to the air compressor which supplies the entire plant, and which is not shown in the illustration. A pressure of 15 lbs. is kept constantly in the tank, so that the oil will be forced up through the pipes which lead to the furnaces. Back of the furnaces is a pressure blower, manufactured by the Connersville Blower Co., and which supplies air to the burners. The burners are of the Tait-Jones' type and work somewhat similar to the gas burner so common in the household of to-day. The oil and the air both enter at the same time under pressure, and in this they differ from the gas burner where the pressue of gas draws the air after it in a like manne to a syphon.

With the air and oil both under pressure and controlled separately it is possible to regulate the flame at will. Needless to say the flame is practically a gas flame with an intense heat and the results are that all the good qualities of the coke are included as far as clean metal, etc., are concerned, and in addition it includes the advantages of a forced draft which hastens combustion and delivers much more melted metal per day.



In the top view will be seen the basement, showing oil-tank and pipes leading to furnaces. Bottom view shows bird's eye view of burners, considerably enlarged in proportion to the furnaces.

The linings

While the oil fuel was the main point to be considered, a few words about the linings will be of interest. This is a subject which always attracts attention for the reason that the lining is usually out of order in every furnace where brass is melted, unless kept constantly under repair. The method adopted at this plant and which bids fair to become popular is to brick the furnace a few inches bigger than is required and then re-line it with an artificial plumbago, known as carborundum. A plug pattern of the proper size is made just the same as would be required for molding. This is placed in the furnace and centered, and the lining material which is mixed to the constituency of core sand, is rammed around the plug pattern, similar to ramming up a core, and the plug is drawn just like drawing the pattern out of a mold. This leaves a nice smooth lining, which will last for many months and which can be repaired at will be re-inserting the plub and ramming in more material. In a future article we will describe this lining material more thoroughly.

Ventilation

Anyone who has ever worked around a brass foundry knows the unpleasant features. The foul smell which polutes the air is not only disagreeable, but unhealthy. The white flakes of zinc which float in the air and which are apt to be inhaled into the lungs are most poisonous. This, added to the sulphur fumes from the coke of the furnaces, made the average brass foundry anything but a pleasant place to earn a livelihood. At the James Morrison works the trouble from this source was dispensed with long ago. An air purifying system connected to a Sturtevant fan keeps the air as pure as the outside atmosphere, and with the modern furnaces it is a strictly up-to-date brass foundry. The type of furnaces here described is only one of the many types of oil furnaces on the market. Oil furnaces are made to suit every class of work, and what is ideal for one line of work is not necessarily suited for others. For the class of work done at this plant this type of furnace is well suited.

Another New Up-to-Date Canadian Foundry

Machines Do Everything Where It Has Been Proved That They Are Best Suited, Converting a One-time Hand Operation Into a Continuous Power Driven Machine

DURING a period of depression such as is affecting the entire world at the present time, it is interesting to note that business is not at a stand-still in Canada. During the month which has just passed there was opened for business in Toronto what is in many respects the most modern foundry in the world. In the two illustrations will be seen different views of this foundry—the Canadian branch of the Grinnell Manufacturing Co., manufacturers of automatic fire extinguishers and cast-iron pipe fittings. This foundry is what can be truthfully termed a production plant. Many features are included which would be overlooked by anyone who had not made a study of foundry engineering.

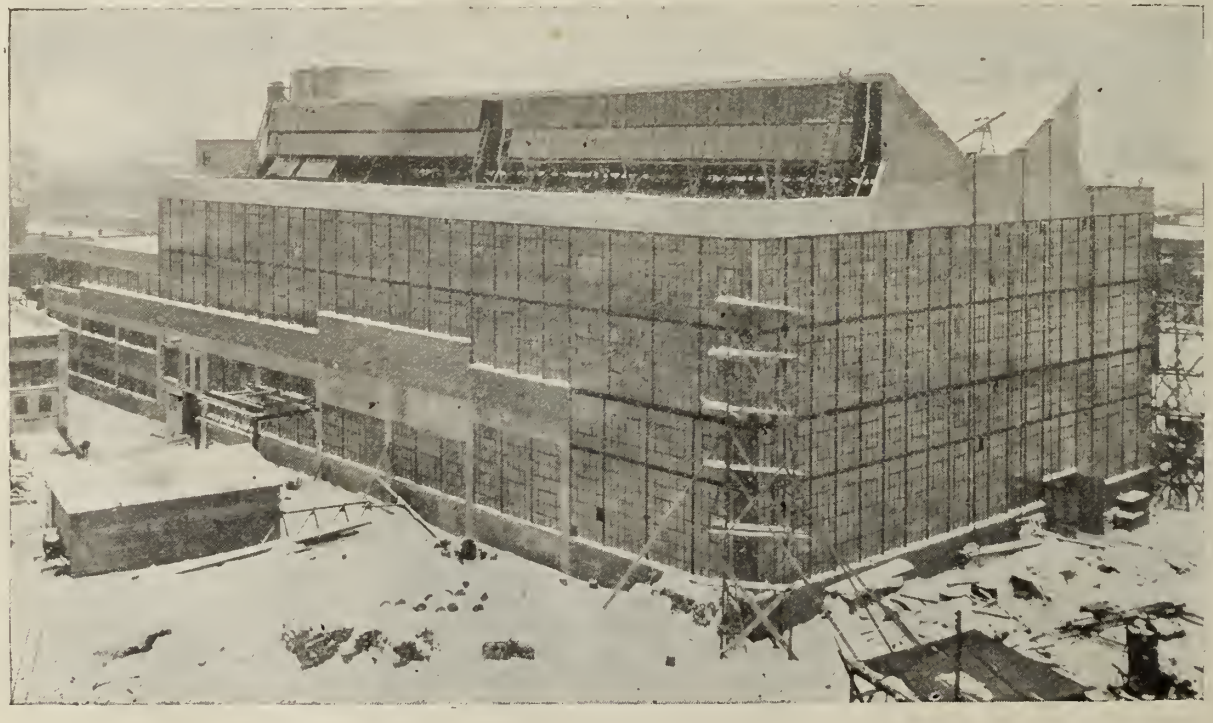
The building is a three-story structure with the foundry on the second floor. The first floor is not in a basement, but is on a level with the surrounding grounds. On this floor the sand is stored and mixed by machinery. The tumbling mills and grinding machines are also installed on this floor.

The second floor, as we have already seen, is the home of the foundry proper. Even the cupola is on this floor. The third story contains the sand conveyors for delivering the sand after being mixed to the chutes which lead to the molding machines. Everything about the place is so complete that the molders do not require to have either shovel or riddle, and do not pour any of their work. When the molding sand is brought to the foundry it is unloaded into a bin within the walls of the first story. Here "two birds are killed with one stone" as the saying goes. The walls of a bin must be vastly more substantial than the ordinary walls of a foundry building, and in order to make double use of the extra strength of this point, the bin is built under the charging floor of the cupola. It is of reinforced concrete and is much heavier than the remaining walls of the building. This bin does not cover the entire space beneath the charging floor, for the reason that the drop from the cupola goes right down to the bottom, and is held in a small bin which constitutes the foundation for the cupola. The second story we have described as the foundry proper, but we might add that at one end of the first floor is a heavy work bay setting across the building. This is served by an electric travelling crane manufactured by the Northern Crane Works, Walkerville, Ont. This bay is used for the heavy fittings and is on the ground floor so as to be able to have the foundations for the heavy Osborne jolters under ground. The metal is melted on the upper floor and delivered to the molders on this floor with the same degree of ease as though everything were on the level, the crane being located at a sufficiently high level to permit of this. With this exception, all the molding, core making, melting and pouring is done on the second floor. A cycle of the operation of the foundry will be of interest.

Cycle of Operation

Presuming that the molding sand has been used at least once and has been knocked out of the molds it falls through a grate in the floor back of each molder (or more properly speaking, in front of each molding machine). These grates are connected with shutes which lead to large sand bins on the two opposite sides of the ground floor. These bins are served by overhead trolley tracks carrying a grab-bucket. After each batch of sand falls into the bin it is wet down and new sand introduced from the new sand bin already spoken of. The grab-bucket now lifts up portions of the new and old sand and lets it fall. After doing this a few times it is mixed as far as this branch of the process goes.

It is now picked up by the grab-bucket and put into a hopper which connects up to conveyors which carry it to the third story. The conveyors in passing through the hopper mix it by scraping off a little of every kind of sand. When it gets to the third story it is discharged into a standard sand sifter and mixer. This machine sifts out all scrap and allows the sifted sand to drop into the



FRONT VIEW OF NEW GRINNELL FOUNDRY, TORONTO.

paddles which work similar to a dough mixer. From here it drops into a Sellers centrifugal mixer which aerates it and mixes it as thoroughly as it is possible for sand to be mixed.

From here it is conveyed to every part of this story and delivered to chutes which are directly over each molding machine. When a mold is to be made the machine operator simply opens the chute and lets the sand drop into the flask. The machines thus connected are for the lighter work and are manufactured by William H. Nicholls Company, Inc., Brooklyn, N.Y., but for the larger sizes of fittings which, as we have explained, are made on the ground floor, the jolters and pattern drawing devices were manufactured by the Osborne Manufacturing Co., Incorporated, Cleveland, Ohio.

The machines on the second floor are placed in rows; one row on each side of the room. As the molds are made the molder places them in rows behind his back, which is all he has to do with them. The cupola is put into blast first thing in the morning, and as the molds are made they are poured by men who are engaged for this purpose only. The pouring floors are served by overhead trolley tracks carrying a number of pouring devices supplied by the E. J. Woodison Co. These devices were illustrated in last month's issue of Canadian Foundryman and are so arranged that practically no exertion is required on the part of the workman, who can pour all day without difficulty, which would be a difficult proposition by the hand method.

As we have already shown the molds after being poured or knocked out over the floor grates and the sand falls to the bins below, to go through the same process over and over again.

The Core Making

As might be expected, the core making on this class of work is about as extensive as the molding, and is, of course, done with a similar amount of automatism. Some of the cores are made on the core bench but many are made on the Woodison pneumatic machine illustrated in the Canadian Foundryman in February. The core oven is most interesting and would make a story in itself. This oven was designed by Mr. H. M. Lane, the designer of the entire plant, and will be described in detail in a later issue of this publication. The cupola is of the Newton type and the blower was manufactured by the P. H. and F. M. Roots Co., Connersville, Ind. The tumbling mills and the ladles were manufactured by Whiting Corporation; the jack lift portable core racks were manufactured by one company and the core wire straightener by another.

It will be seen from the description that there is a big variety of equipment, but it must not be imagined that there is anything complicated.

Designed by Practical Men

The H. M. Lane Co., of Detroit and Windsor, designed and superintended the construction of the buildings as well as the equipment, and being practical foundrymen they selected each and every unit according to the duties to be performed.

While nearly every manufacturer of foundry equipment had a hand in supplying equipment, it was not arranged that way with a view to helping any one. Each unit was purchased from whoever had what was required for the purpose. In a future issue we hope to illustrate this plant more fully from the inside, showing the electrical and pneumatic installations as well as innumerable other interesting features which have been overlooked. Enough, however, has been shown to demonstrate that a modern foundry for production work is a machine rather than a plant. Although the different units of equipment come from all directions, they combine together and make one grand automatic machine which takes in raw material and delivers finished castings.

SHELLAC—WHAT IT IS AND HOW IT IS MADE

Shellac, as every patternmaker knows, is one of the most essential items connected with a pattern making establishment and a short story about how it is made will be of interest.

Shellac is the product of a tiny insect which infests certain trees in the East Indies. The term lac is the same as the Hindu numeral lac—a hundred thousand—and indicates the countless myriads of insects which make their appearance each spring on the young, tender shoots of the infested trees. These feed upon the sap in the bark, and after passing it through their bodies exude it in the form of a crimson-colored resin, which in course of time hardens into a tiny semi-transparent cocoon or shell.

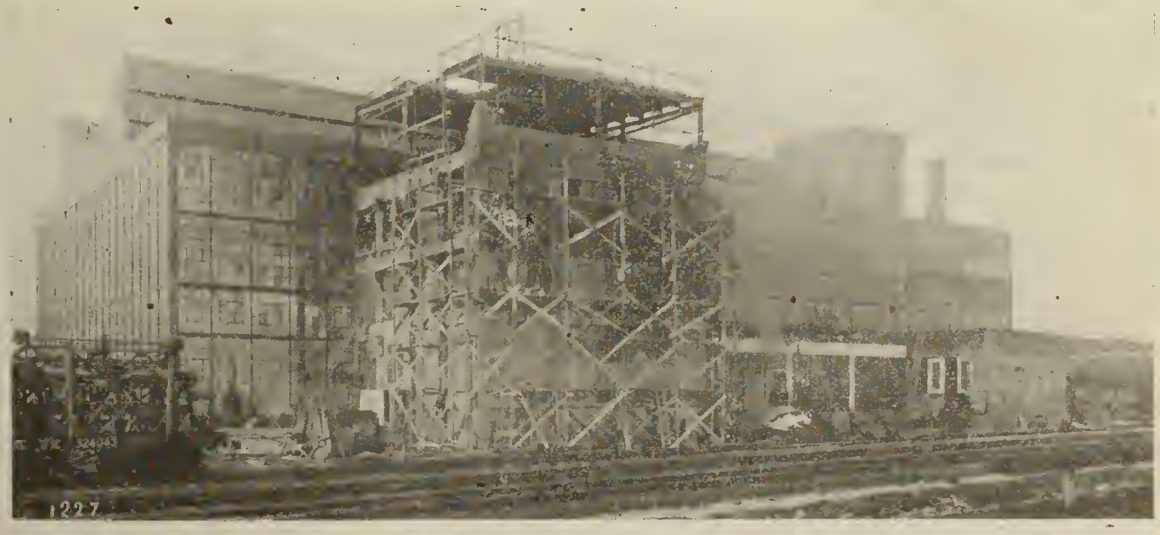
It is these cocoons which, after being melted in boiling water and poured out on a cold surface, constitute the shellac of commerce.

Shellac has many uses. Sealing wax is practically all shellac. It is the principal ingredient in most varnishes. Hat manufacturers cannot make hats without it, a shellac solution being essential for the stiffening process. Photographers find it absolutely necessary in their business, a similar solution entering into the composition of all films, while it is, of course, the main essential in all kinds of lacquer work. In fact, there is hardly any substance that is so generally used in so many widely different trades and manufactures.

Yet but for the fact of a tiny insect desiring to keep itself warm and comfortable the world would have none of it.

LIKES CANADIAN FOUNDRYMAN

Mr. R. C. Samson, superintendent of the Opsal Steel Co., Limited, Vancouver, B.C., says, "We enjoy your magazine very much and can truthfully compliment you on its improved tone and prestige."



REAR VIEW SHOWING RAILROAD SWITCHES

Repairing a Broken Roll Casting by Burning

By Burning on a New Neck an Otherwise Good Roll Was Saved From the Scrap and the Mill Spared a Lengthy Shut-down

By J. W. TAYLOR

THE subject of burning is one of exceptional interest in the foundry and while it is one of the oldest practices of the trade, it is one of the least understood. Acetylene gas and thermit welding are far superior in some places and under certain circumstances, but there are places where there is nothing quite so good as the old reliable process of burning. It is a lamentable fact that while this is such an old and valuable part of the business there are many molders who do not know anything about it and who, in fact, have never heard of it. It is for these that I am writing this article. The chief point is that if a casting has a piece broken off of it this piece can be replaced by a new piece exactly like the old one and secured to the casting in such a manner as to make it equally as strong and durable as an entirely new casting at a greatly reduced cost, and in many cases saving many times its cost in getting a breakdown in working order so as to prevent shutting down an entire plant, while a new piece is being cast and machined. Take for instance a rolling mill breakdown. A set of rolls is out of commission if one happens to be damaged. If the rolls are stopped all the furnaces and other equipment which supply the rolls are likewise affected. In fact, one breakdown in a rolling mill practically ties up the mill, so no wonder that a breakdown makes a lot of excitement and calls for

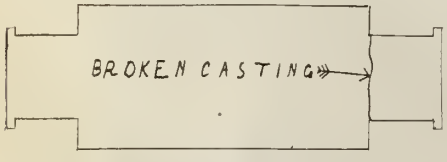


Fig. 1—Roll with neck broken off.

whatever method of repairing the damaged part will be the most rapidly brought into action.

When in rolling mill practice gear teeth wear to sharp points and the journal are long past their time for relining an extra tough piece of material comes along and in passing through the machine something usually breaks, the point of least resistance being generally the gears, but once in a while the neck of the roller gives way, as shown in Fig. 1. Unequal design, a weak metal mixture, and segregation of the particles internally (in foundry patois known as sponginess) being the contributary causes.

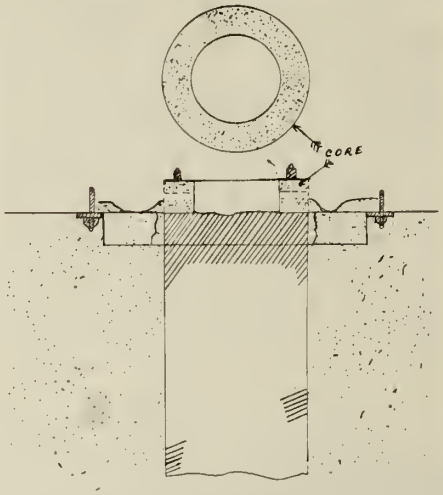


Fig. 2—Core arrangement so as to heat the end, preparatory to burning on the new neck.

With much lamentation and waving of arms the example under discussion was thrust into the foundry one morning with the usual cry of distress. "We gotta have it tomorrow," and "Can't you fix it somehow?" as a chorus. So, after soothing the customer by telling him that being foundrymen we could do anything with the aid of nothing, we proceeded as follows:

We got two pulleys, one the size of the outside diameter of the body of the casting and one for the neck. These we used as a core box and made a core six inches thick, with two run-off openings on opposite sides as shown in Fig. 2. This ring core was made of regular core sand mixture and dried. A hole was dug in the floor and the broken casting rammed into it. A drag half of flask was bedded in level with the floor and the broken face of the casting came level with this. A parting was made here and parting sand scattered on. The broken neck was now put on in its proper position, and the cheek of the three parted flask put in place, as shown in Fig. 3. A run-off plug, shown to the left of Fig. 3, was put in position and the cheek rammed up to the top. Another parting was made and the cope put on. A heavy riser, also shown in Fig. 3, was put on the center of the neck and the cope rammed up. Binder was used in the sand so that the cope and cheek could be dried. After lifting off the cope the neck casting was now loosened and withdrawn. The flow-off plug was drawn in and the middle box lifted off and put in the oven to dry. While this was being done the ring core spoken of, which was made in the improvised core box of two pulleys and which is shown in Fig. 2, was now fitted on and two weights placed on it to hold it down. It was now ready to be poured. A ladle of very hot metal was poured slowly on, allowing it to flow off

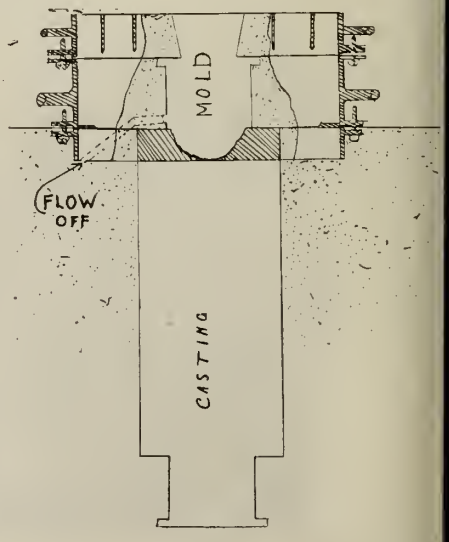
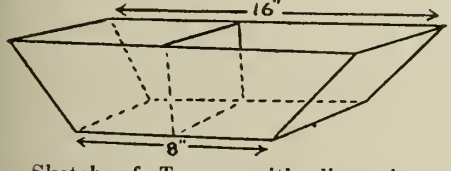


Fig. 3—Everything in readiness to pour the new neck.

through the opening provided for the purpose, all the time probing with a rod. After about 800 pounds had been run through the ring core it was taken off and the cheek and cope quickly put into place and secured with clamps, when pouring commenced again. After pouring through enough to bring the end of the casting to a fluid state again, as it was when the ring core was removed, the flow-off shown in Fig. 3 was plugged up and the mold filled to the top. The big riser on the top was used as a pouring gate until filled, after which it was used as a feeding head. It was given a good feeding with the rod going well down, so as to jab into the end of the roll at first. The riser was kept full of very hot iron and fed until solid. Two hours later the casting was taken out, cleaned and dressed. It was now taken to the machine shop and after machining the newly cast neck it was ready to be delivered the following morning, thus saving time and machining and keeping everybody in a good temper.

INFORMATION ON TUYERES

The cupola which I am using is 28 inches in diameter inside of the brick lining and the tuyeres are about 14 inches from the bottom. There are five tuyeres each measuring 4 inches by 8 inches, making a total area of 168 square inches. The area of a 28-inch cupola is approximately 616 square inches. If we divide 616 by 168 we get 3.85 or approximately 4, by which I mean to say that the area of the tuyeres is 1-4 of the area of the cupola., Sturtevant's rule calls for 1-9 or less than half of what I have. I can't say as to the effect of the larger tuyere area. Can you?



Sketch of Tuyere with dimensions. Note bridge wall in centre. Upper side represents inside when in operation.

I have figured out the melting capacity of the cupola by your rule, which you published a few months ago, and if we assume 7 lbs. of iron per pound of coke we get 4,480 lbs. per hour, while Sturtevant's rule of 7 lbs. per square inch gives 4,310, quite near enough, though I think 6 lbs. of iron to 1 lb. of coke is nearer to what this size of cupola should melt. We have a good fan and an abundantly large wind pipe but I am not sure if we have a good type of tuyere; the plan submitted is a fair likeness. They are set wide side in, the object being to make it easier to punch the slag loose after the bottom is dropped. The supposition is that this is wrong and causes a diffusion of the air so that the centre of the charge gets too little.

Anyway, the iron comes dull, and I would like your opinion on how the cupola should be charged, and also if you would recommend any alterations in its design.

Answer.—The design of tuyere and the general construction of your cupola is all right. The idea of having the tuyeres larger on the inside than on the outside has other advantages than the one you mention. The best authorities have agreed that there is nothing to be gained by trying to force the blast to the center o fthe fire. As soon as the blast enters it comes in contact with lumps of coke which prevent it from having a straight course to the centre. If the tuyere is the same area right through and a piece of coke gets lodged in front of it, the efective area is reduced. By having the tuyere larger on the inside the area would still be sufficient unless an exceptionally large piece of coke got in the way. The subject of forcing blast to the centre of the fire is one which is worthy of study. Supposing the fuel did not obstruct the blast, would it make any difference? If the blast does not get to the centre of the furnace, what will be there? Is it to be supposed that a vacuum could exist there? This subject is treated to some extent in another article in this issue.

DOES THE BLAST GO TO THE CENTRE OF THE CUPOLA OR UP THE CHIMNEY?

The subject of blast is an interesting one, but one which seems to be but little understood. Supposing we build a cupola with the tuyere area ten times as great as is required and out of all proportion to the volume of air which the blower can supply, and then build a fire in this cupola and turn on the blast; what will be the disposition of the blast, or air as we should term it, since we realize that it will not enter under very much presure?

If the reader will study the lesson which we published in the December last issue of this publication on the subject of pneumatics and which, by the way, is taught in the Public Schools, he will observe some features which should assist him in arriving at a conclusion. The mysterious force, known as gravlty, attracts everything and draws it towards the earth. The degree or extent to which the earth's attraction is exerted upon a substance is what we term the weight of that substance. There is nothing but what has some weight. Even the lightest gas is drawn towards the earth, but the atmosphere or air which surrounds the earth has a greater attraction, or in other words, weighs more, and while the gas is being drawn towards the earth, the air is being drawn to a greater extent and as a consequence the gas is crowded or forced away from the earth until it reaches an altitude where the air is sufficiently rarefied to allow the gas to remain in equilibrium.

Now if we go back to the cupola. The burning oxygen of the air and carbon of the fuel want to remain right where they are, but the incoming air has more weight and consequently forces the burning gases to make room for it. The terrific speed at which the blaze is seen passing the charging door of the cupola is not an indication that it has a desire to rise, it simply means that it would have risen from atmospheric pressure if there had been no other, but with the artificial force caused by the larger volume of air coming into the cupola it ascends at a much more rapid rate.

From what we have seen of natural philosophy we must conclude that every substance clings to earth if possible, but the heaviest substance gets the preference and that even blazing gas wil remain at the bottom and fill every crevice until something heavier comes along to crowd it upward and that if the air at the centre of the cupola becomes converted into carbon dioxide or any other combination of gases it will not be allowed to remain at the bottom, but will be forced out of the way by the incoming cold air, no matter how far this air has to travel in order to get there. It is folly to suppose that the incoming blast turns upwards as soon as it enters the cupola, as we so often see illustrated in foundry publications. No matter how big the cupola is, the coldest and heaviest air will certainly remain all over the bottom until it absorbs sufficient heat to make it lighter than what is following it. This, of course, is rapid, and the fresh air which is coming in is invariably heavier than what is already in the cupola and it will invariably follow the lower course and go as far as there is an opening. What is wanted is to have tuyeres of sufficient area to admit plenty of air and then have a blower of sufficient capacity to deliver the air. If the area of the tuyeres is greater than there is any need for it does not in any way affect the actions of the air after it passes the tuyeres.

BECOMING A CITIZEN

Changing one's nationality requires certain qualifications, such as residing in the country of adoption for a specified time, after which a paper containing a list of questions has to be filled out. A Russian Jew, after residing the required time in the country, was given the form to fill out, and this is how the first three questions, with their answers, appeared:

Name—Joseph Levinsky.
Born—Yes.
Business—Rotten.

PATTERNS AND CASTINGS

By W. P. ESSEX

Historical Outlines of the Progress in the Art of Metal Casting From the Pre-Historic to the Middle Ages

ARCHAEOLOGISTS tell us that the casting of metal articles in molds of clay and stone originated in a very remote era, away back in the bronze period of prehistoric times, which predated the iron period by many years. This latter statement the metallurgists are inclined to except, claiming that iron must have been known and worked before copper, reasoning that the absence of iron objects as old as existing copper or bronze ones, is due to the perishing of iron and other corrosive metals. That there have been preserved to us through the unnumbered ages so many specimens of the work of those early inhabitants of the earth, is indeed remarkable. See Figs. 1, 2, 3.

Discoveries made in Egypt of recent years convince us that the Egyptians, six thousand years ago or about 4700 B.C., had reached a high degree of mechanical precision, employing tools and appliances of copper and alloys, that were marvels of ingenuity and accuracy.

In Genesis, fourth chapter,we read: "And Zilla she also bare Tubal Cain, an instructor of every artificer in brass and iron." In this brief account is given all the known history of the earliest recorded metal worker. The artificer we look back to as the father of the arts of fashioning metals, he probably lived about 3875 B. C.

At a later date, probably about 1491 B.C., the ancient scriptures again introduce us to another skilled worker in metals, Bezaleel, the son of Uri:- "A man filled with wisdom and knowledge, in all manner of workmanship, to devise cunning works in gold and in silver and in brass." To this artificer and his assistant Aholiab, was entrusted the task of producing the many various metal parts used in the construction of the Tabernacle. While most of the furnishings seem to have been made of beaten metal, there were also made some large castings, notably the forty brazen sockets and one hundred silver sockets which formed the foundation of the sanctuary. These were solid massive blocks, each weighing a talent (94 pounds).

This silver was furnished from the "half shekels" which every Israelite had to contribute. It is interesting to note that seventeen thousand and seventy-five shekels of silver remained after the sockets had been cast.

The Phoenicians, possibly the most advanced people of remote times, were at a very early period skilled in the making of metal articles of utility and beauty in brass and iron, some of which were cast.

The people of this remarkable nation, famous for their industry and progress in the mechanical arts, were besides daring navigators and traders. They manufactured, transported and carried on the commerce for all the other nations of their time, and in their own ships, extending their trade even to distant Britain, from which source they no doubt obtained their supplies of tin and copper. The Cornish tin mines at that period were possibly the only known source of that metal.

Explorations made in Mesopotamia, Ancient Assyria, have revealed some wonderful pieces of metal work, massive gates of bronze, masterpieces of art with molded ornament and inscription.

The metal artificers of King Solomon's time must have possessed wonderful skill in the casting of metals, judging from the description given in the book of Kings and Chronicles, of the massive bronze castings, that were made for the decorating and furnishing of the temple at Jerusalem in 1005, B.C.

There is no doubt that among the Hebrew artisans there were skilful workers in metal, but Solomon wanted an expert. So he sent a messenger to the King of Tyre, requesting that monarch to find him "a man cunning to work in brass and in iron, and with skill to grave."

That the skilful artificer sent by the king was both a brazier and patternmaker is inferred from the king's reply to Solomon, which said, "I have sent a cunning man skilful to work in gold and in silver, in brass and in iron, and also to grave any manner of graving and to find out every device which shall be put to him."

The description does not go into details sufficiently to enlighten us as to the type of furnace used to melt these large quantities of metal, or of the design of foundry, but it must have been well lighted and ventilated, for it further says, "That he cast them in the clay ground in the plain of Jordan."

The recorded history of Greece and those islands of the Mediterranean which comprised that remarkable union of Hellas, begins about the year 1100 B. C. An early history, which is largely

RELICS OF THE BRONZE AGE FOUND IN IRELAND.

FIG. 1. SWORD

FIG. 2 SPEAR HEAD. FIG. 3. PAL-STAVE.

FIG. 4. EARLY GREEK STATUE, MADE OF THIN METAL STRIPS, HELD TOGETHER WITH PINS.

FIG. 5. CAST BRONZE HEAD FROM THE EXCAVATIONS OF HERCULANEUM.

ıythical, goes back to a more remote ıate, probably 2000 B.C.

While massive ruins of Ancient Greece till remain, mute evidence of a prehistoric race, of which little has been earned, it is known that in the latter art of this period a flourishing civilization existed. Many hundreds of metal

FIG. 6 EARLY GREEK SWORD OF . BRONZE.

objects of rare workmanship, which have been brought to light, show that considerable progress had been made in the metal working arts, especially that

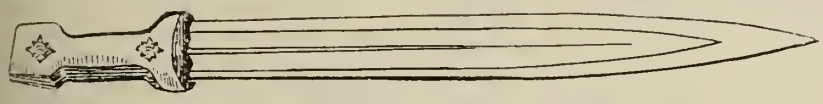


FIG. 7. LATER GREEK SWORD. THE FINEST. .

of the goldsmith's.

Then something happened and this promising civilization lapsed, a period dark and chaotic followed, which lasted for some 450 years.

With the passing of this long night of darkness came the dawn of a new era, which may properly be called the beginning of historic Greece.

With the new dawn came new birth to Greece, wonderful rapid advancement in the arts and crafts followed, especially in the art of sculpture.

The early metal work of Greece was no doubt influenced by a knowledge of the arts and crafts of Assyria and Egypt through their intercourse with the Phoeincians, from whom they derived much of their knowledge in the working of metals.

Although their early efforts were crude when compared with their later work, they developed in time a system of art and science all their own, which in conception and execution stands unsurpassed among the reatiaons of any people.

The early metal statues of the Greeks were made on carved wooden figures, overlaid with thin plates of beaten copper, hammered and worked into shape to fit the wooden form, to which they were fastened with nails. Fig. 4. Later they resorted to casting them in sand, and it is worthy of note that the practice was to cast them in as few pieces as possible.

It would seem that the composition used in the casting of these figures, was soft enough to permit of the casting being tooled and finished afterwards, by which means the artist brought out the fine lines, which gave expression and beauty to the finished statue. See splendid head, Fig. 5.

The Phoenicians supplied the Greeks with in tin; copper was obtained from the island of Cyprus, and silver, gold and lead from Spain. Iron was possibly obtained from the same source. Although the Greeks had early obtained this metal from Carthage, which they made into wrought and polished iron, it does not appear, however, to have been widely used in their arts.

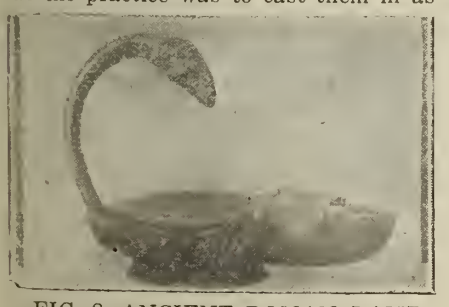


FIG. 8. ANCIENT ROMAN LAMP —BRONZE— OF FINE DESIGN.

FIG. 9. CAST BRONZE LAMP OF EARLY ROMAN WORKMANSHIP.

Bronze was their favorite metal, which was employed, not only in the making of statuary, but for utensils and weapons. In Fig. 6 and Fig. 7 is shown two examples of Greek swords made of a particularly hard and fine quality of bronze.

A notable example of the lavish use of this metal,—320 tons of which, it is said, was used in the construction of the colossal bronze statue of Apollo, which stood at the entrance to the port of Rhodes. It is said to have been 105 feet in height, and to have taken twelve years to complete.

Possibly the finest remaining pieces of ancient bronze work are "The Bronze Horses," above the main entrance to the cathedral of St. Mark, Venice. These remarkable examples of Greek metal art have an eventiful history and have traveled much. One writer speaks of them as the "four horses that breathe in the brass of Lysippus," a former sculptor in bronze of the fourth centry B.C. They probably adorned the front of a temple in Corinth in that period.

In the year 146 B.C. they were brought to ome by Minnius, and placed in the equare of the senate. Later we read of them as adorning the Arch of Nero in Rome, and afterwards that of Trajan.

In A.D. 330, the Emperor Constantine removed the boze hoses to Constantinople to cown the Hyppodrome of the new Rome; there they remained for nearly a thousand years.

When Constantinople was beseiged and captured by the Crusaders and Venetions in 1293 A.D. the horses were removed to the square of St. Mark at Venice, where they remained for four hundred years.

Following the invasion of Italy by Napoleon and his victorious army, the horses were taken to Paris, where for a few years they graced the arch of the Place du Carroussal.

With the establishment of the Lombards-Venetian Kingdom for Austria in 1814, the horses were returned to their former position above the portal of San Marco. During the late war they were removed from this exposed position to a place of safety by the government.

In the days when Rome was proud mistress of the world, her artisans were renowned for their skill in the manufacture of metal articles. Some interesting pieces of cast bronze are illustrated in Figs. 8, 9, 10. Though the omans were a military people, making conquest their policy, they encouraged the arts and sciences of the Greeks.

Following up their conquests by colonizing, they sought to stimulate industry in those subjucated countries, and by their efforts, and that of the preceeding Greeks, the mechanical arts and sciences was spread throughout Europe.

With the downfall of the Roman Empire, 476 A.D., the arts declined with the change that took place in the world's political and industrial history.

The ancient metal workers of Etrusca China, India and Japan, have also left many rare and interesting examples of bronze casting, the work of this early period.

FIG. 10. ANCIENT ROMAN FIRE DOGS OF BRONZE.

The Oxy-Acetylene Cutting and Welding Torch

Uses of the Torch for Cutting—Process of Welding Together Two Separate Pieces as Well as Building on a New Piece to a Defective Casting

THE operation of cutting steel or iron is by heating the metal at the first point of contact to the red with the ordinary welding flame. This flame is then continued with a jet of pure oxygen turned on, which unites with the carbon of the metal and produces rapid combustion or burning, and disintegrates it with surprising rapidity. The cut is narrow and smooth with no material damage by oxidation. It may be made in any shape and the process will be found especially valuable in making many kinds of dies and in fitting steel plates.

Steel beams in structual work, steel arches, steel boilers, steel piling, shaped deck plates for steamships and the hardest steel vaults may be cut with ease.

From this it will readily be seen that cast iron would be easily handled. The secret of the process lies in the high temperature of the flame which increases the temperature of the metal so rapidly that very little heat is diffused into the body of the part, most of it, therefore, being available for fusion. The number of heat units actually absorbed by the mass of the metal is a very small fraction of that required to bring the same part to a brazing heat with an ordinary gas or oil blow pipe, and very little if any warping takes place.

Welding on Small Pieces.

One of the first points to be understood when considering the use of oxy-acetylene welding is that the heat actually has to come in contact with every particle of the metal to be welded. It is impossible to weld by this method where this can not be done. If a small boss is required to be atached to a casting it is useless to cut out a disc of metal the same as the boss with the idea of welding it on. The correct way is to add the metal, drop by drop, until the required size is reached. The casting would, of course, have the flame played on it until it was in a state of fusion after which a bar of the metal to be added is held in front of the flame. This bar is melted by the flame and falls, drop by drop on the spot where the boss is to be built on. In the case of a cracked arm in a wheel, the cutting torch is used and the crack enlarged at the top and cut down to the centre of the arm in the shape of a V. The rod of iron is now held in the flame and the metal allowed to drop into the recess until it is filled. The wheel may then be turned over and the same process applied on the other side. If the wheel is too heavy to turn over, the V-shaped groove may be cut through to the bottom and if the bottom is not cut away, it is not necessary to put anything under the arm.

Repairing Broken Castings.

In the case of an expensive casting having a small piece broken off, it is quite possible to built on the piece and save the casting. I remember working in a foundry where marine engines were built. One of the engines was completed and was being shipped, when it met with an acident and the flange at the bottom of one of the legs was broken off across one of the corner bolt holes. The casting in itself was quite an expensive piece to make, and in addition to this it had a lot of machine work on it. This was too expensive a piece to throw away, so it was taken to the foundry and a new corner was burned on by the process used by Vulcan in the year one; that of pouring ladle after ladle of melted iron on the spot until it was sufficiently heated to adhere to the metal which would form the new corner. This was successfully accomplished and was considered quite an achievement by the moulders, but this would have been an ideal job for the oxy-acetylene burner, and this concern actually had an installation in the machine shop, but it never occurred to them to use it. I did, however, see them use it later on, in repairing a defective pipe. They had a long pipe which weighed about three tons, and it was of peculiar shape, which made it quite an expensive casting to make. It was poured from both ends and some loose dust had been forced up in a pile in one spot about midway between the two ends. Otherwise it was a good casting. This was taken to the machine shop and the defective spot cut away into the clean metal by means of the cutting torch. The bar of iron was then put in front of the flame and the cavity filled, and a little bit of additional metal added to satisfy the commissioners whose duty it was to accept the pipe. This pipe formed part of a high pressure pumping system and it filled the bill.

The Torch

The torch is the most important factor in any kind of autogenous welding and cutting. The type generally admitted to be of the best construction consists of two small pipes or conduits terminating at one end with hose connections, the other entering a recessed head that receives the torch tips. The pipe for acetylene is screwed into a cylinder about one and one-half inches in diameter, which serves for a handle and is packed in porous material that prevents the possibility of communicating a flame beyond that point. A complete discussion of torch and construction w be published in a future article.

Oxy-Acetylene Welding Outfit

The outfit for doing this class of wo is not extensive but like anything el if good work is to be done a comple outfit should be at the workman's d posal. The two tanks and several leng of hose would appear to make up mo of the kit, but the following outfit giv the man everything he requires: Ox gen generator or tank; acetylene pre sure generator or tank; welding tor with tips, graduated sizes; cutting tor with tips, graduated sizes; acetyle regulators, with pressure indicator oxygen regulator for welding wi high and low pressure indicator oxygen regulator, for cutting with hi and low pressure indicators; oxygen a acetylene hose welding, 12-foot length oxygen and acetylene hose for cuttin 12-foot lengths; colored eyeglasse wrenches; hose connections; fluxes a filling rods; preheating torches a furnace; special work tables; hamme chisels and files, breast drill and bi grinding wheel and hacksaw, asbest gloves and apron.

DESCRIPTION OF THE "BROOK ELECTRODE ECONOMIZER FOR ELECTRIC FURNACE

In our April issue, page 21, appear an article by Frank Hodson on "He Losses in the Electric Steel Furnace In this article was described an electro economizer, invented by Mr. F. W Brooke, vice-president of the Electr Furnace Construction Co., Philadelphi but the diagram showing operation w omitted.

The electrode cooling rings or econ mizers are now fitted as standard equi ment on all "Greaves-Etchells" furnac and they have also been used with co siderable success on various other typ of furnaces. They have been in consta operation on a number of furnaces f nearly twelve months and a considerab saving in electrode consumption has be effected.

The "Brooke" economizer depends f its action on the well-known fact th hot gases under pressure if suddenly a lowed to expand quickly lose their hi temperature. The gases generated in t electric furnace are only combustible high temperature and in the presen of oxygen. All other cooling rings us on electric melting furnaces simply co these burning gases, which ignite imm diately on leaving the furnace. In t "Brooke" economizer the gases are alte natively contracted and expanded a the gases do not ignite outside the fu

nace. The roof ports and the electrodes are kept cool and the gases leave the furnace at too low a temperature to ignite.

The gases pass between the electrode and the roof port holes, then through the small clearance space marked "A" in the illustration, and then into a relatively larger chamber, marked "B." The gases are allowed to expand in this chamber, resulting in their giving up a large amount of heat, which is absorbed by the water in the cooling ring. From chamber "B" they are once more contracted through the small clearance "C" and they then pass into the large and chief expansion chamber "D." The design differs slightly with amorphous or graphite carbon electrodes, but the practical effect is that no flame issues from the top of the furnace.

When the hot gases are not allowed to ignite it has been found that the electrodes do not pencil off. This gives a very considerable saving in electrode consumption and also insures that the full area of the electrode is always available. Where pencilling off occurs, the arcing point on the electrode is always considerably reduced, and this means that current is obliged to flow through restricted area of electrode. In furnaces not fitted with the "Brooke" economizer this resistance by excessive current flowing through a small area results in the whole electrode being heated up by power that should go into the arc. This also causes trouble at the electrode joints, the holders and all the outside electrical connections.

The device is protected by patents, but by arrangement with the manufacturers, the General Combustion Co. of Canada, Ltd., New Birks Bldg., Montreal, announce that they are in a position to supply this device for any type of furnace.

ADDED EVIDENCE THAT CAST IRON CUTTING HAS REAL COMMERCIAL VALUE

Instances indicating the value of cast iron cutting as a real economic factor in industry continue to multiply. The following cases are fairly typical of its emergency uses:

The superintendent of a large Indiana manufacturing plant asked if he ever had occasion to cut cast iron, replied in the negative. In his opinion it might be an entertaining stunt, but he saw no practical utility for the practice in his plant. Curiously enough, a few days later in remodeling some of the powdered coal furnaces in the power plant it was found that the cast iron floor plates for the upper deck were several inches oversize and would have to be cut off. The plates had been hoisted and bolted into position at one end before it was discovered that the other ends extended over instead of resting on the centre of the supporting "I" beam. The attempt to correct the fault by cutting off the excess lengths with drilling tools proved very slow work. After two and one half days of continuous drilling, during which time gangs of brick masons and machinists were forced to wait in idleness and only two of the four plates had been cut, the superintendent ordered a cessation of the drilling and asked the aid of Oxweld operators to complete the job.

The oxy-acetylene operators, using a standard Oxweld type C-6 torch, cut the two remaining plates in one hour and 45 minutes. The work was done so accurately that the finished plates were found to line almost perfectly with the centre of the beam. The plates were 1¼ in. thick and 60 in. long, the operation consuming 310 cubic feet of oxygen and approximately 100 cubic feet of acetylene. An interesting feature was the fact that the cutting was effected directly over and without injury to the beam.

The superintendent and master mechanic were so pleased that the entire equipment was purchased outright, for while occasions for cutting cast iron might be rare, the Oxweld cutting blowpipe used is the same that is employed in cutting steel and wrought iron, for which there is frequent use in all manufacturing plants.

Another demonstration was recently made at the works of a large Pittsburgh foundry, where some heavy iron castings were cut by Oxweld operators. It may be of interest to note that the acetylene for this job was furnished by a low pressure acetylene generator, and that, owing to the use of an Oxweld type, C-6 blowpipe, it was not necessary to preheat the work, excepting as this was done automatically by the multiple jet flames of the blowpipe in pursuing the prescribed cutting manipulation.

FINE ART GEMS ON THE SITE OF UR.

The following interesting report from the land of Ur would be still more interesting if we were sure it was accurately reported. We are not saying that it is not accurately reported, but if iron heads which have been in existence since 2,500 year B.C. are still in a good state of preservation it explodes a lot of theories which are being advanced. A common argument is that the ancients did not understand working in iron, while another popular argument is that iron was probably used, but during the long span of years since their day it has all corroded and gone to dust. Now comes this story which says that iron was used thousands of years ago and is still in good shape. However, we will believe the copper part of it and conclude that the reporter mistook some of the copper castings for iron The story is that recent excavations in the neighborhood of Abraham's birthplace by Dr. Hall of the British Museum Egyptian department resulted in many interesting and valuable discoveries. Dr. Hall's researches led to the conclusion that the Babylonian city of Ur, from which the patriarch Abraham set forth on his wanderings to the Promised Land, existed long before King Urenger repaired it 2,500 years B.C. The excavations revealed a number of copper and iron heads, probably intended to be supporters of the throne, with eyes made of shell and jasper, and teeth and tongue all fastened on with copper wire. These heads were of cast copper. To cast copper is an exceedingly difficult operation, and the accomplishment of it is an indication of the high point of civilization attained by these early dwellers of lower Babylonia. As the heads were hollow, they were filled with bitumen and clay to make them more durable. This fact explains most probably the enigma of the image mentioned in Daniel which was a mixture of metal and clay.

Two wonderful columns were discovered. The trunks of these were wood, which perished long ago. They were covered with diamond scales fastened with copper wire. These scales were red, black and white. Nothing like these columns had ever ben seen before. It is an absolute novelty in archaeology.

One of the most notable finds was a wonderful relief in copper depicting two stags facing in opposite directions and vainly endeavoring to escape from a lion-headed eagle that grasped them by the tails. Dr. Hall interprets the relief as depicting the political and military supremacy of the mighty town of Lagash (modern Tello) over other towns.

AMBROSE MONEL IS DEAD

On May 4th word was received that Ambrose Monel, vice-president of the International Nickel Company and chairman of the board of directors, was dead at his home in New York. The metal to which his name is given is perhaps more generally known than the man.

Monel metal is a natural alloy, which may be cast, rolled or forged. Its composition varies, but usually contains from 24 to 28 copper, 67 to 74 nickel, and from 0.5 to 5.25 of iron. It was introduced about the year 1906 by the Oxford Refining Company, of New Jersey. It has become widely and favorably known and has a continually increasing use on account of its high tensile strength and non-corrosive properties which has made it a valuable metal in valve stems, seats and discs, screw propellors, etc.

The fact that Canada is the leading producer of nickel, as well as the natural ore from which this metal is procured, makes Monel metal of particular interest to Canadians, and now that Ambrose Monel is dead the announcement of his death is the first intimation to many that he ever lived. But (to pervert a Shakespearian phrase) "the good which men do lives after them," and Ambrose Monel's name will go down to posterity when he will be better known than during his lifetime.

Items of Interest to the Brass Foundry

BEARING METAL

THE subject of bearing metal is one which calls for a lot of study and some of the results of this study will be surprising. In fact, the results of investigating any alloy will be different from what would be expected and in order to describe bearing metal it will be almost necessary to describe all the nonferrous metals which are liable to be used. In bearing metal there are two distinct characteristics which must be taken into consideration, viz., a material which will allow the shaft to run with the least amount of friction and will also wear well. Naturally the conclusion to be arrived at would be that a good hard alloy or even a fairly hard cast iron would be good, but before arriving at a conclusion we will ask ourselves a few questions and relate a few facts which we know and see what bearing they have on the subject.

Supposing we take a cast iron bearing with a babbit chamber and we bore the ends of it to an exact fit on the shaft, and then fill the chamber with pure lead, what is going to be the consequence if we start the shaft revolving and connect it to a heavy working machine? I am not going to say that it would be a success, but still it would not be the failure that might be imagined. The lead, of course, would squeeze out if there was any place for it to squeeze out at. The ends being a perfect fit, will hold the lead in place and the lead being a very dense metal does not allow itself to be forced into a smaller volume, so it holds the shaft up and prevents it from wearing down the ends.

Now, speaking of lead, the best authorities place lead as the greatest antifrictional metal amongst the list of metals, but lead of itself is too soft to be used alone, as it can not be retained in the recess of the bearing. It would run for a while, but it would soon wear enough to allow the lead to work out at the ends. If antimony is added to the lead it increases its hardness, but makes it brittle. If tin is added to the antimony and lead it toughens the combination and makes a good bearing metal.

Most of the babbit metals now on the market are alloys of lead, tin and antimony.

Now, so far we have only dealt with babbit, but while it is all right for some lines of work it would not stand the weight and shock of heavy machinery. Even with the lightest machinery it is only a liner for an iron bearing. For heavy machinery it is customary to make the shell of brass and line it with babbit metal. This gives strength as well as antifrictional qualities. When we get away from the lead we get away from the antifriction qualities. The original inventor did not use any lead, but his metal, while expensive, was not as good as the cheaper mixtures now in use.

Where this kind of a mixture cannot be used and we are forced to use a bronze bearing the question is, "What composition will give the best antifrictional qualities without impairing the strength? Gun metal was for years considered the strongest and best all round material. It consisted of 1 pound of tin to every 9 pounds of copper. This made a very strong bronze, but it was not particularly hard and it did not wear very well. By increasing the tin it became harder, but more brittle, and at the same time more expensive. After years of experimenting with expensive bronze mixtures it has been found that the old common yellow brass has more tensile strength than any of the copper-tin alloys. It has also been found that 30 per cent. zinc and 70 per cent. copper, which is just an ordinary yellow brass, has a tensile strength of 30,000 lbs. From 30 per cent. to 41 per cent. zinc brass increases in tensile strength with the content of zinc and decreases in ductility. Its tensile, transverse and torsional strength reach its maximum at 41 per cent. zinc. From this it will be seen that if we have an alloy of 59 copper and 41 zinc we have the best we can get with zinc and copper. This will have a tensile strength of 60,000 lbs., double what 70 and 30 would show.

Knowing that zinc in proper proportions will increase the strength and knowing that lead is the best anti-frictional metal, it should be an easy matter to use these metals to advantage in preparing alloys. A subscriber has asked us to advise him as to the best mixture for making trolley wheels. These wheels have to convey the electric current, as well as have strength to stand up against the rough usage to which they are subjected, and incidentally have good wearing and antifrictional qualities. As copper is among the best electrical conductors, no attempt is made to reduce it, and as a result of considerable experimenting it has been found that 92 of copper, 6 of lead and 2 of zinc stands up against the various abuses better than anything yet found. With copper at its present price this is not an expensive mixture, and will give the best of satisfaction.

Mechanical Construction of Steam Valves

Showing Different Types of Valves and Giving the Foundryman an Insight Into What His Work Goes Through After it Leaves His Hands

By P. W. BLAIR

TOO much consideration cannot be given the installation of practical steam valves and insuring against the waste of steam and giving practical service.

The engineer has discovered that valves of exceptional durability are necessary for such purposes as throttles for injectors and steam pumps, blow-offs for water columns, drains for main headers, etc., in all of which cases the valve is never fully opened and the surfaces are subjected to the tremendous wear caused by wire drawing. Owing to the large number of valves used in engine rooms and manufacturing plants which come under the supervision of the engineer he should be fully conversant with the construction of the valves and their repair.

A first-class valve must be capable of being opened and closed at will and all its moving parts must be controllable from without and stay in a position without danger of being lost or misplaced. A valve must be tight when first installed and it must stay tight and if it begins to leak there must be means for quickly repairing it without taking it out of the line. The valve should be so constructed that it can be packed at stuffing box when under pressure and not necessitate a shut off on any parts of the line.

When the engineer has full control over all the valves in a plant he should use none but the best. He then becomes fully posted with the construction of them. They must be strong and compact and the same valve must be able to handle steam, gas, air, water, oils, viscous liquids and many acid and alkaline solutions through a wide range of temperature and pressure conditions.

The stems of spindles should have coarse and deep cut threads, preferably a square thread, and composed of manganese bronze—copper 57 to 60, zinc 37 to 40, iron 1, tin 0.75—which has the correct wearing qualities, as one of the weak spots on steam valves on the market to-day is the spindle as the wear is on same at all times and foreign substances come in contact with the threads and wear them away.

There are a number of types of valves in common use at the present time and the following illustrations will show the

good and bad points in their construction.

Fig. 1 shows the Jenkins type of flat surfaces on both disc and seat which can be used with a composition or all metal flat disc and give good service. A stock of these composition or all metal discs can be always carried in stock by the engineer and replaced when worn out or leaks develop.

One of the most usual forms in use on seats and disc of valves and specified by naval boards, also marine engineers, is the conical meeting surfaces sometimes on a 35 or 45 degree angle. See Fig. 2.

In large diameter valves this seat is practical, as the disc can be machined in manufacture with a single point tool and the same applied to the seat.

No matter how carefully tools are made it is practically impossible to make the angle the same on disc and seat. As the tools have to be ground and hardened while in use the angle of the seating tool is not the same angle which forms the disc and necessarily it is subjected to heavy grinding, which makes a shoulder form on bottom or top of disc. There is also a large area of bearing surface which allows foreign matter to lodge on seat or disc.

Fig. 3 illustrates the ball joint constructed seat or disc, universally used on unions or couplings. This style of a seat is practical in a union or coupling joint but impractical on a steam valve which is opened and closed at all times and subjected to hard use. Owing to the large seating surfaces employed it allows far too much sediment or foreign substance to collect.

Fig. 4 shows a form on a steam valve seat and disc concave, which does away with the sediment or foreign substance lodging thereon.

One of the chief difficulties to overcome is the upkeep of tools to keep true form on disc and seat, also excessive grinding.

This style of concave-convex construction is used on automobile inlet and exhaust valves made of hardened steel carefully ground and intended to be reground at frequent intervals but for bronze or softer metals it has no advantage.

Fig. 5 illustrates the modern mechanical and practically constructed valve seat and disc. It shows a convex seat with a bearing all around of 1/16 inch to 5/64 inch on a 1¼ or 1½ valve which give a minimum amount of surface for sediment or foreign substance to collect thereon.

With a disc on a true ball radius and composed of a hard bronze alloy or monel metal or a metal of any kind so that it is harder than the seat alloy a line contact can be procured which will stand a pressure of 2,000 pounds.

When a new disc is to be installed in the disc holder the old disc is readily removed by the unscrewing of the disc nut, which has two flat sides that correspond in shape to the inside of disc. By the simple process of regrinding the seating surfaces of all regrinding valves numerous grindings can be performed on same.

To regrind, remove the trimming by unscrewing the union connection between the body and hub. Insert a pin or wire nail in the hole in disc and place an abrasive composed of flour emery mixed with oil on the disc-seating surface. Replace trimmings on body, leaving union nut unscrewed, and regrind. After regrinding wipe abrasive from off both seat and disc faces and remove pin previously placed in disc and stem, then assemble. This saves the expense and time of taking the valve out of the line and the possibility of holding up the line's use for a number of hours.

Valve connection on a pipe line is an important item and a few practical notes covering the subject may prevent serious mistakes.

Screw-end brass valves should always be gripped on the hexagon at the end at which the pipe thread joint is being made. If the wrench is applied to the opposite hexagon the body is subjected to a twisting or straining effect which may be and often is sufficient to distort the seat and cause a serious valve leak. When grease or cement and red lead is used in a pipe-thread joint it should be applied to the threads on the pipe and not in the valve to prevent the compound fouling the seating surfaces.

When operating valves the opening of a steam valve under pressure should always be done with considerable caution. The valve disc should be eased from its seat slightly for a few moments to allow a circulation to become established and then opened full slowly. To do otherwise is to invite water-hammer of the most violent kind with all its attendant dangers. Likewise when closing a valve the circulation through it should be gradually checked and the closure effected without injurious forcing.

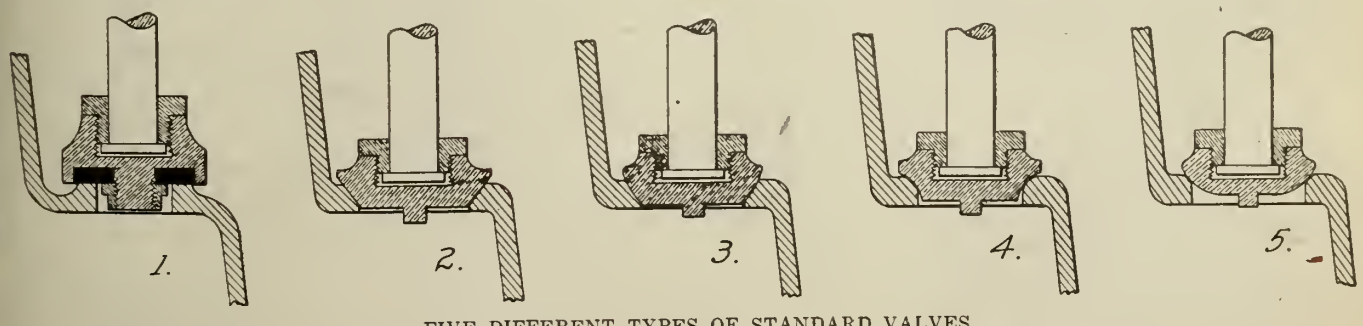
Letters to the Editor

Question.—We have noticed from time to time questions and answers in your magazine under the Plating and Polishing Department, which have been very interesting and of considerable benefit to ourselves. We have been wondering whether or not you could help us with a proposition which we have before us?

We are making a small clothes line pulley, approximately six inches in diameter, which is made of sheet steel. The pulley is formed in a press which forms the shape, and two of these discs are riveted together. The material used is black steel and the frame, or holder, of the pulley is also made of black steel.

Our trade is calling for this pulley to be galvanized. We have been trying electro-plating, but it seems to be too slow and expensive a process, and we would like information as to how these should be treated to be hot galvanized. Can you give us the necessary information?

Answer.—I have not seen galvanizing done on a very small scale, but I see no reason why it could not be done. I will give you the process, and you may see fit to build according to the size required. You should have a steel kettle big enough to receive the largest piece you will be called upon to galvanize. You should rivet the two parts of the shieve together before galvanizing. In fact, no matter what is to be galvanized it should be completed as near as possible, so long as it does not exceed the size of your kettle. If not done this way the rivets will not be galvanized and will rust. In addition to the kettle you will require three wooden vats and a drying oven. The first vat will contain diluted sulphuric acid, while the second contains water and the third muriatic acid. The article to be galvanized is placed in the sulphuric acid (commonly known as oil of vitrol) where it remains until the scale is all dissolved, after which it is taken to the water vat



FIVE DIFFERENT TYPES OF STANDARD VALVES

and washed. This is done to remove the dissolved scale and acid with which it is covered. When this is done, it is put into the muriatic acid which eats off all that remains of the sulphuric acid and inicdentally soften the steel itself in a slight way, leaving a thin film of chloride of iron on the surface. Muriatic acid is a combination of chlorine and hydrogen sometimes referred to as hydrochloric acid. This acid, as we have shown, not only cleans the surface of the iron but eats into it, and the chlorine combines with the iron, forming the coating referred to . The article being treated is taken in this condition and placed in the oven and dried with this coating on it. When thoroughly dry and preferably when still warm, it is immersed in the melted zinc. When the melted zinc comes in contact with the chloride of iron it becomes impregnated and the zinc is actually alloyed with the iron through the influence of the chlorine rather than adhering to the surface.

Now About the Kettle.

The kettle which contains the melted zinc is built into an arch and a continuous fire kept burning as the zinc should not be allowed to set in the kettle. If no work is to be done, the zinc should be removed. Melted zinc, like most melted metal, will oxidize if exposed to the air, and to prevent this a flux, consisting of sal amoniac and sawdust is introduced. Glycerine is sometimes used in place of the sal amoniac. The flux melts and forms an airtight scum on top of the metal. When a piece is to be dipped, the scum is skimmed away just sufficient to admit the article.. .

In addition to the scum on the top there is a sort of dross which settles on the bottom and which must be removed periodically or else the kettle will be burned and incidentally the heat of the fire will be retarded from reaching the zinc. This dross, when removed is returned to the refinery and again converted into good zinc.

In order to prevent the dross from adhering to the bottom, and also to facilitate its removal a small amount of lead is introduced into the zinc. Lead will not mix with zinc, and being the heavier of the two it settles to the bottom and remains in a melted state; as the dross settles it rests on top of the melted lead and is easily removed by using a long handled, perforated ladle. If there is any further information or assistance required, do not hesitate to ask.

* * *

Question.—Will you please give me information regarding the following: I bought a quantity of scrap iron, among which were some old melting kettles which had been used for melting aluminum or babbit making, and were very heavily coated with dross. What effect would this have on the castings? Or would the dross be thrown off and not become part of the casting? Any information will be gratefully received.

Answer.—It is not advisable to use too much of this kind of scrap at any one heat, for the reason that apart from the babbit metal and aluminum there is always a quantity of oxide which will have a bad effect on the castings unless you are using a good flux and slagging your cupola, in which case there is no trouble in getting good castings. In regard to the aluminum and babbit metal, they are entirely different in their actions. If aluminum is put into a ladle and the iron tapped into it, it has a deoxidizing effect and is beneficial, but if babbit metal is introduced the lead in it would not mix with the iron, but the tin will do so and have a hardening effect. Of course this is not your question. If charged into the cupola it is doubtful if any of them would stand up against the terrific heat required to melt iron. My experience with all these metals is that they go up in smoke and have no effect on the iron which was charged with themm. However, I would not use too much at a time.

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CLECO PRESSURE SEATED AIR VALVE

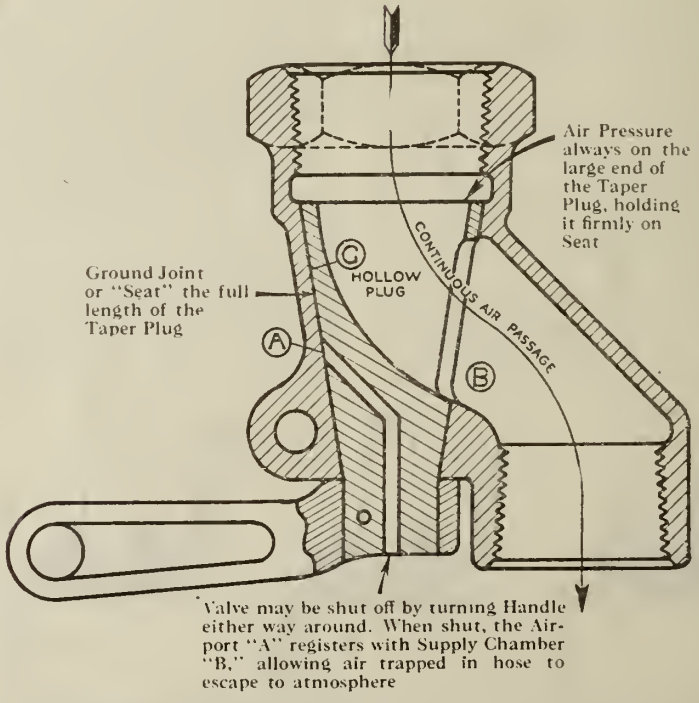
The Cleveland Pneumatic Tool Co., of Cleveland, Ohio, has recently brought out an air valve for general use in air service, which contains new features of great interest to all users of compressed air. The sectional drawing herewith illustrates the new valve designed to eliminate air losses through leakage in transmission.

The destructive action of compressed air upon valve seats, packing and gaskets is well known and there has been for some time an insistant demand by air users for a valve that would stand up in high pressure pneumatic service; in view of the above it was determined by their engineer to design a valve in which the air could not come in contact with the seat—thus avoiding replacement of seats, and also to utilize the "air pressure" as a "seating agent" to hold the valve plug on its seat—thus eliminating packing, gaskets, stems and springs and reduce the valve parts to three, i.e., body, plug and handle.

This was successfully accomplished by using a "hollow taper plug" with the large end uppermost; the air entering at the top, passing through and out of an opening in one side of the hollow plug into the supply chamber, which connects directly with the air hose without the air coming in contact at any time with the valve seat—ground joint—which is the outer wall of the plug as indicated by the letter "C" on the drawing. The long "arrow" shows the direction of the air in its travel through the wide unobstructed air passage of the valve, which is free from any angle turns to impede its progress. The short arrow indicates the "point" on the large end of the plug where the air pressure is constantly forcing the taper plug against the walls of the valve body forming a perfect seat.

The valve is provided with a unique waste arrangement to allow the accumulated pressure in the air hose to escape to atmosphere when the valve is shut off as shown by air ports "A" and "B" on the drawing; this is to safeguard the operator, who, when disconnecting the hose from valve often receives a gush of air in the face and accidentally gets scale or grit in his eyes.

The new valve has been subjected to


Air Pressure always on the large end of the Taper Plug, holding it firmly on Seat
Ground Joint or "Seat" the full length of the Taper Plug
C
HOLLOW PLUG
CONTINUOUS AIR PASSAGE
A
B
Valve may be shut off by turning Handle either way around. When shut, the Air-port "A" registers with Supply Chamber "B," allowing air trapped in hose to escape to atmosphere

PRESSURE OF THE AIR RETAINS THE CLOSE SEATING OF THIS VALVE

alph S. Cooper, vice-president and eral sales manager of the Independ- Pneumatic Tool Company, 600 West kson Boulevard, Chicago, who has returned after eight months in ope establishing branch offices and ncies for the company, has been ap- ted general manager in addition to other duties.

* * *

leyer-Chalmers, Ltd., is the name of ewly organized concern with a capi- zation of $75,000 to operate a busi- s at Sault Ste. Marie, Ont., and man- ture automobiles, trucks, tractors, farm machinery. The directors are Sault Ste. Marie men, being William Ewing, Walter C. Meyer and William lmers.

* * *

rantford, Ont.—The Buck Stove rks, as was announced in a former e, has been acquired by members of McClary Mfg. Co., of London, Ont., a new company has been formed by McLary, William M. Gartshore, n McGunn, and others, with a capital $500,000, under the name of "The py Thought Foundry Co., Limited."

* * *

obert J. Black, who, for the last nty-five years, has operated a foun- and machine shop at St. Catharines, , died in his home in that city a weeks ago. Mr. Black was seventy s of age and was a machinist by e, having served his apprenticeship he works of C. Yale & Co., formerly St. Catharines. Some time ago he osed of the foundry department to J. Farrow, who still operates it. sons, Norman and William, are now ying on the machine shop business.

The Convention and Exhibit of the rican Foundrymen's Association not be this year but will be held in the Spring. In our next issue will give a more detailed explana- regarding the decision of the Dir- s. It might here be mentioned up to 1912 all the conventions held in the Spring, and only on ac- t of delay in completing the build- was it decided to postpone it un- Fall. However, our readers will be posted on every movement in con- ion with the convention, and we can re them that the next convention follow the same rule which al the rs have done, and be better still, any which have preceded it.

Vickers, Limited. — Vickers House, Broadway, Westminster, London, S.W.1, manufacturers of pneumatic moulding machines to the patents and designs of John Macdonald & Son, Ltd., Glasgow, are issuing their catalogue to the Canadian trade. Their machines, which are known and marked as "Ajax," are of the air-driven jarring type, and include plain jarring machines, jarring and pattern drawing machines, jarring, turnover and pattern drawing machines. They range in size from 4-inch bore of cylinder up to 24-inch cylinder, with tables and other dimensions to suit any size of work. The book also shows the Vickers patent pattern plate, which is described in detail and which is said to greatly increase the output of the foundry, where variety work is done and one machine is called upon to do different jobs, the idea being that a variety of different sizes and shapes of jobs can be placed to fill the capacity of the flask, with the assurance that the cope and nowel will coincide at the point of juncture. In addition to the molding machines the book shows a few of the other articles, such as portable forges, etc., which are manufactured by the company. The book is well illustrated and the descrpitive matter leaves nothing to tell.

R. S. Griffith, 371 St. James St., Montreal, is their Canadian representative.

A Guide for Increased Produnction

is the title of a neat circular being issued by the P. H. & F. M. Roots Co., Connersville. Everything published by this company has some reference to their positive blower, but the main feature of this pamphlet is their patented guide pin or flask guide. Many claims are made for the pin which would seem to be well founded. One of the main arguments is that it pays for itself by reducing the rejected castings traceable to faulty guides. It is a V shaped pin separate from the lugs which hold it on to the flask. It is fastened to the lugs by means of a key which can be withdrawn and the pin removed in case the flask is to be stored away. The pin can be longer than the depth of the flask and if stored in the yard might be damaged or thrown out of alignment. Being removable, it can always be kept in good shape. Following is what the company say about their flask guide:

This foundry innovation, although extremely simple, prevents any shift in flask and permits the cope to go back on the guides absolutely straight, with the result that in core work the cores are bound to be lined up. It is designed to wedge in true alignment, something possible with the old-style guides only when flasks and guides are new. It serves to guide cope and drag when making lifts and allows for a perfect return after pattern has been drawn. The result is that faulty castings, due to shifts and fall-outs, are entirely eliminated.

The design is such that there are no threads to jam with sand or rust, thereby preventing rapid adjustment. If the V-guide pins are removed, when molds are completed and clamped ready for pouring, the parting line is accessible to mudding back of the guides, which completely eliminates run-outs. This feature alone is highly desirable. It is obtained only by the use of this guide and is absolutely impossible where permanent cast pins or temporary wood guides are used. And, as a large percentage of faulty castings are caused by run-outs, the eliminating of these run-outs effects, of course, increased production.

The pins are instantly adjustable with no other tool than a hammer or gagger iron. There are no bolts, nuts or screws, and no wrench or screwdriver is necessary.

They are made in all sizes with various length pins which are interchangeable, adjustable and removable to accommodate all desired draws, and fit every type and size flask.

Snap flask guides are provided with an angle-shaped bracket or ear which makes them convenient to handle and allows for making draws with the fingers.

JAMES CUNNINGHAM CALLED BY DEATH

James Cunningham, a well known foundryman of St. Catharines, passed away suddenly at his home, No. 3 Wolsley Avenue in that city a few days ago. The deceased was born at Niagara-on-the-Lake, 76 years ago and moved to St. Catharines with his parents when a young lad. Here he learned his trade with the late J. N. Oille in the old Oille Foundry, later the CCunningham foundry, on St. Paul street.

For several years Mr. Cunningham carried on thebusiness himself retiring about two years ago. It was through his efforts that the first electric car was operated in St. Catharines.

He is survived by his widow, six daughters and one son, Fred, who still operates the foundry on St. Paul St.

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A. R. KENNEDY Managing Editor

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

F. H. BELL, Editor
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THE MACLEAN PUBLISHING CO., LIMITED, 143-153 UNIVERSITY AVE., TORONTO, CANADA

Our Mineral Resources

"ONE of our greatest disappointments as a manufacturing nation has always been our shortage of coal and iron. While we lead in many valuable minerals we lacked the very things which we needed the most. During the last few issues of this publication we have been showing how we could get around the coal shortage by using electric power generated from our various waterfalls and incidentally by using oil products which we are in good shape to supply. But this still left us short of iron. Our ores were generally low in iron and high in sulphur, making the expense of producing pig iron greater than the market value of the iron. We had good deposits of iron ore which was so high in sulphur that it was more profitable to manufacture sulphuric acid than pig iron.

Now comes the report from Cobalt that an enormous deposit of hematite iron has been discovered in this district, lying within the triangle on the points of which are Cobalt, Porcupine and Sudbury, the three great mining fields of Ontario, which have become world-famous for the silver, gold and the nickel-copper ores which they produce. The new deposit lies in the townships of Yarrow and Morel, within 14 miles of the railway at Elk Lake.

The ore is exceedingly high grade, massive hematite, showing in one place over a width of four to five feet, and the owners declare they walked along it for about 150 feet in which the iron content is approximately 70 per cent. In addition to this massive ore there is a series of four dikes or lenses of quartz and jasper in which the iron content is 55.98 per cent. An analysis from the Morel deposit gave the following results: Iron, 55.98 per cent.; silica, 19.60 per cent.; phosphorus, 0.07 per cent.

Geologists had previously expressed the opinion that nothing more than low-grade iron ore would be found in Northern Ontario, but a high-grade discovery has actually been made, and the ore in sight may be measured in thousands of tons. This information is not based upon the opinion of amateurs, but is on the strength of the opinion of leading mining men and on an analysis made in the Ontario Government ore-testing plant at Cobalt, where some of the ore has been found to contain more than 70 per cent. iron, and with the general analysis showing more than 55 per cent. iron.

The ore occurs in sedimentary rocks, being conglomerate and slate, and its general characteristics are almost identical with the Gogebic iron range, which has made the States of Michigan and Wisconsin world-famous as producers of iron ore. The ore in this new range in Northern Ontario occurs in large lenses, and is traced for close to a mile on the surface.

The discovery was made by Frank Wescott, of Elk Lake, Ontario. Westcott claims that he knew about the presence of the iron for some years and has repeatedly shown samples to geologists and told them the district in which he found it. These geologists appear to have disbelieved the story and refused to accompany the discoverer to his supposed find. It was not until Wes cott told his story to B. W. Hartley, a well-known prospector of Cobalt, that he succeeded in receiving attention. Mr. Hartley accompanied Wescott to the scene of the find and in his own words states that what he saw was "almost unbelievable." He packed out 140 pounds of the ore for testing purposes and after securing a large acreage of territory gave the details. Hartley and Wescott intend to interest Eastern Canada operators in the development of the deposit and the general impression is that the discovery will be measured in importance with those of Cobalt and Porcupine.

Mining men who are familiar with the Lake Superior regions and the deposits there, when shown the ore from the new discovery, were heard to make the remark that it was "Gogebic iron," meaning that it came from the mines on the Gogebic iron range in the Lake Superior region. The new discovery lies in sedimentary formation, conglomerate and slate formation being in evidence, with well-rounded pebbles occurring in the conglomerate. Wescott claims to be familiar with the mining area in Michigan and Wisconsin and declares that the geological structure of the new discovery has many characteristics in common with that big iron field.

Wescott declares that he believes the new deposit in Yarrow and Morel townships may actually be related to the northeasterly continuation of the deposits of the Lake Superior region, which have enabled the United States to lead the world in iron ore production, that country having produced upwards of 70,000,000 tons in a single year, the 1919 output amounting to 60,000,000 tons, of which 85 per cent. was taken from the Gogebic, Marquette and Menominee ranges of the Lake Superior region. By way of comparison it may be noted that the iron ore deposits, which have been mined to depths of as much as 1,500 to 2,200 feet in the Lake Superior region, are of the following composition: Iron, 54.01 per cent.; silica, 6 per cent.; phosphorus, 0.03 per cent.

Optimism is the Keynote

THE Canadian Founders' and Metal Trades Association with headquarters at rooms 718-719 Continental Life Building, Toronto, are approaching the public in what cannot help but be considered a very businesslike manner.

This organization, it will be understood, is similar to manufacturers' association, only that they stick pretty close to the foundry business—being banded together for mutual benefit. Now that times are quiet, without reason, the association is endeavoring to stimulate their membership to hunt up prospective customers and report the same to the association who in turn will do what they can to prevail upon the "prospect" to move now instead of waiting for some one else to move first. For instance, if a manufacturer is asked to quote prices on a contract which is about to be let and then

hears no more from it he reports to the association and they sent the "prospect" a letter similar to the following:

Dear Sir:

We are advised that you have in mind placing some contracts on which you have recently asked for quotations. In this connection we desire to present to you the following facts:

Industry in Canada to-day is dormant, and industrial plants are in many cases either closed down or operating short time and short handed. Unemployment is abnormal, and appears to increase.

The hopes of everyone are centered upon an immediate resumption of business, and a gradual return to healthy, normal conditions.

Manufacturers are being asked daily to quote upon a great volume of business, but no orders of any consequence are being placed.

In some instances, Canadian business which should be kept within Canadian borders, at least until our own industries are on a normal basis, is being placed with United States firms.

It is highly desirable to maintain amicable trade relations with the United States, but until this crucial period is past, we believe Canadian manufacturers should have the preference so far as possible.

Our manufacturers are eager to keep their plants in operation. Wage earners are eager to have employment. Revisions downward have been made all along the line in material prices, and wages, BUT,

Everyone is apparently waiting for the other fellow to "take a chance."

It is up to the investor—the buyer, to stimulate the situation, encourage the development of Canadian industry, and through it the growth of Canadian as a nation, by placing every pending contract with some Canadian firm immediately.

We ask you in the name of Canada, and Canadian industry, to assume your part in an immediate resumption of business by placing any contracts you may have pending with some responsible Canadian firm at once.

We anticipate the courtesy of a reply, and sincerely trust you may be counted upon to do your part in the best interest of Canada in relieving the present period of industrial quietude.

Canadian manufacturers are as busy to-day as the manufacturers of any other country but still they are not by any means busy. The prospective buyer in every country is holding off from spending a dollar which he can possibly keep in his pocket, but if everybody lays down and waits, everybody will be the loser. The money is in the world and it should be in circulation.

The clause about spending money at home sounds very patriotic, but it is doubtful if it will ever be very popular. Nobody spends money at home if he can do better somewhere else. If Canada is ever to be the nation which she aims to be it must be through business principles and not through sentiment. However, we are with the Foundrymen's Association in their effort to get things moving, and in doing so we are confident that we are voicing the proper sentiment when we advise people to start the ball arolling. It will have to start some time and it might as well be now.

Our Molding Machine Number.

THE July issue of Canadian Foundryman will be our annual Molding Machine Number. In this number we will endeavor to show the advances which have been made along this line. It is not our intention to advise the reader but to point out to the best of our ability what he has before him to choose from.

As we have pointed out on previous occasions, some machines are first class on some lines of work and not so good on others, while other machines are general purpose and perhaps not so good on any one line. The prospective purchaser will be the best judge of what he wants, to suit the line of work he proposes to put on the machine. We believe that the coming Molding Machine Number will be one of the best numbers we have ever published and we expect our readers to look forward to it—the July number.

Training the Foremen.

INCREASED morale, lower labor turnover, reduced costs, and greater production are resulting from better training of foremen. So states H. H. Turkey in a recent issue of Forbes. He continues in this manner:—

Poor foremanship makes poor workmanship and one poor foreman may destroy the efficiency of an entire organization. Experience has shown that a foremanship course, to be effective, must be tied up with the tasks that constitute the foremanship trade. The foreman must learn by practice and not by precept.

Most executives would be benefited by a course in foremanship. The foreman is an executive, but of a lower degree. As the foremen are the men who come in contact with the executives, these executives should be familiar with the qualities of good foremanship.

The purepose of foremanship training is to increase production and decrease costs. The lecture method of training has been followed, but this is usually the lest effective, as the speech often goes over the foremen's heads. The use of motion pictures in connection with talks has been effective, as has also the exhibition of models and designs. The development method, in which the foremen, under the leadership of one who is familiar with the plant, discuss different angles of foremanship, has proved of value.

The apprentice method, while it has certain advantages, has not proved very desirable. The most satisfactory method is that of having the foremen taught by a foreman. This can be done by selecting the most capable foreman in the organization and sending him to any of the various agencies established through the Federal Board for Vocational Education, where he may be trained in the art of teaching. When he is returned to his organization it will be found that he will conduct foremanship training that is suited to the particular needs of his plant.

Have You a Salvage Department?

SPEAKING on what "scrap" brings, a writer in Factory, tells how one concern saves money by utilizing its so-called waste material. He writes as follows: The plant consists of eight mills, all of which have a lot of waste material. Before there was a salvage department all this waste material laid about in small piles inside and outside the plant. It was always in the way. The plant superintendent had charge of the selling of old material. The junk dealers would come to the office and tell him that there was a small pile of junk lying in such and such a place. The superintendent would then call in the foreman and ask him what was in the pile. To get rid of the pile, the foreman sided with the junk dealer. Then the junk dealer would offer something for the lot and the sale was made. Most of the piles contained good pipe fittings, brass, babbitt, and other such good material.

This practice naturally made a salvage department essential. So a building was erected for this purpose only. The formen in the plants are get to get rid of their junk, so they are more than willing to bring it to the salvage shed.

In the shed there are two laborers and a handy man. These men tag the material just as it arrives. Then they pick out the material that is of absolutely no use and consign it to one end of the shed. The usable material is cleaned and painted. If necessary, repair parts are used to reclaim something that has been scrapped. In this way the good material is put in first-class condition ready for further use.

It is then sent to the stockroom. When the mills requisition something, this salvaged stock is given out as new stock. The mills rarely notice the difference. The repairing that is done is on valves, pipes, pulleys and so on. New seats, stems or discs are placed in a broken valve. Pipe fittings are rethreaded. Worn shafting is turned down to the next size, and pulleys are cleaned, painted and entered on the stock list.

very severe tests under both high and low air pressures, the high pressure being 500 lbs., as well as submerged water tests and is said to have successfully passed the most exacting tests that could be devised on liquids under pressure and on acetylene gas lines.

MAKING THE MOST OF HIGH SPEED STEEL.

By A. J. WILSON*

HIGH speed steel is of vital importance to all lines of manufacture, for there is no manufacturing concern that is not more or less interested in the use and conservation of tools and tool steel. This applies more especially to the automobile or automobile parts manufacturers whose tools, particularly high speed tools, are a very large item of expense.

During the war when the price of high speed steel was very high, we were awakened rudely to the fact that we were using this material in an extravagant manner. As production of war material was the important demand at that time, the only alternative was to buy more steel as needed. But we also got busy to find some means of making this high priced steel stay on the job longer and to do more work while it was on the job.

As it was necessary to have a starting point, this was made at the blacksmith forge. Due care was taken that heats were satisfactory when the forging was done. One point that the forge man must make certain is that his steel is heated through uniformly. The outside may be up to forging heat and the inside many degrees cooler. The effect of this can be appreciated readily if a piece of steel in this condition were to be put under the hammer. The outside being softer than the center would prevent the hammer blows from displacing the metal in the center of the piece, therefore it would cause a number of small ruptures which undoubtedly would cause trouble in hardening.

No tools should be hardened direct from the forging operation, but should be annealed before hardening. To save time this may be done by heating them to about 1650 degrees Fahr. in the forge fire and then burying them in ground mica which for convenience can be kept in a cast iron box near the forge. Air slacked lime also will answer the same purpose.

Preheating

After being annealed the tools are ground before hardening, so as to have the least possible amount of stock to remove after the hardening operation. In hardening high speed steel the advantages derived from proper preheating cannot be overestimated. Preheating to 1450 to 1550 degrees Fahr. in a slow furnace and then bringing the heat up quickly to 2250 to 2300 degrees Fahr. in another furnace generally gives satisfactory results. Although in the case of an intricate tool which is liable to crack, better results may be obtained by two preheats, one about 1450 degrees, another about 1750 degrees Fahr., and from this placing the tool into the hardening furnace. Handling the tool in this manner, the shock of being transferred to hardening temperature is not so great and aids by not causing quick expansion of the thinner sections which naturally heat the more rapidly.

The supposition that any fire is good enough for a preheat is erroneous, because the same care must be exercised in running a furnace for preheating as for final heating if best results are to be obtained and the tool is to come out free from scale. Tools must not be allowed to soak in the preheating furnace.

As a quenching medium, fish oil, a standard soluble quenching oil or coal oil will give good results. Coal oil is a little more drastic and it must be used with some caution on account of its inflammable nature. For turning tools, boring tools and the like, where points only are hardened and a little scale does not matter, an air blast will be found satisfactory provided that the air is free from moisture.

During the past few years much experimenting has been done in tempering or drawing back of high speed steel tools and it is along this line that the most improvement has been made. Drawing back has been a common practice for years but not to the extent that it is now carried on. It has been found that steel of standard make when properly hardened, using as high a heat as can be used safely, then drawing back to 1050 or 1100 degrees Fahr., will give its best service. This applies more directly to tools doing extremely heavy work and those required to remove a large amount of metal. The tool is tougher and stronger, still retaining its original hardness, and is not given to crumbling on the cutting edge.

With tools required to give a smooth finish and take a light cut, drawing at so high a temperature is not recommended but a draw of approximately 425 degrees Fahr. in oil has been found to give satisfactory results. A tool drawn at this temperature will retain a keener cutting edge on light work than one drawn at 1000 degrees Fahr. Drawing through the intermediate temperatures, that is between 425 and 1000 degrees Fahr. has not, to the writer's knowledge, ever been productive of any marked degree of success. In fact if it were found necessary to draw a tool made of high speed steel beyond 500 degrees Fahr., it is preferable to jump to the upper range. A chart put out by a well known maker of steel gives some very valuable information in regard to high temperature drawing. This chart gives 800 degrees Fahr. as the point at which the greatest softness occurs.

Before being put to work tools must be properly ground, care being taken to avoid drawing temper or checking. It is customary to use a dry wheel which should be free cutting and true. If water is used sufficient must be used to keep the tool cool as alternate heating and cooling is very conducive to cracks or small checks which will cause trouble later on.

An occasional bar of steel will contain a pipe or seam. This can be determined easily by the appearance of the crack in the hardened tool and if the bar of steel from which this tool was made is examined, the seam or pipe generally can be discovered without much difficulty. Such a bar is practically worthless, but such cases are rare and most of the failures in tools can be laid at the door of the men who handle the steel after it is in the manufacturing plant. In other words, there is much more trouble due to faulty methods of handling than to defective steel.

Getting the Most Out of the Tool

Now that the tool is ready for use how can we get the most out of this tool? In using the term tools we are referring to tools for removing metal such as are used in turret lathes, screw machines, engine lathes, etc. In the writer's company there is employed a man whose title is "Turning Tool Supervisor," his duty being that of providing the workmen with proper turning tools.

It might be well to mention at this time that 90 per cent. of the work is performed under what is known as the straight piece-rate system. Any one connected with manufacturing where a bonus or straight piece rate is in effect, knows from experience how essential it is to keep workmen supplied with proper tools. The average man working straight day rate will find little fault with his tools if they are not of proper shape and right hardness. He will probably reduce his feed and speed to the point where they will stand. Put this same man under one of the above mentioned methods and if tools do not stand up he will soon be heard from.

Some time back, this problem confronted our company and after consideration it was decided to appoint some one man whose duty it would be to furnish the workmen with tools properly forged, hardened and ground. By this arrangement a saving on tools was effected and production was increased between 15 and 20 per cent. One of the foremen was selected for this new position and he had a man's size job, for in a shop where this method has never been tried it cannot be accomplished over night. One of his first problems was to gain the confidence of the workmen. Second, he was compelled to sell them the idea that a certain new shaped tool would do the work as well or a little better than a certain shape of their own pet idea. It is also a well known fact that no two workmen will grind a tool alike but this was overcome by using a mechanical tool grinder. Using this as a starting point we were soon able to convince the men that tools could

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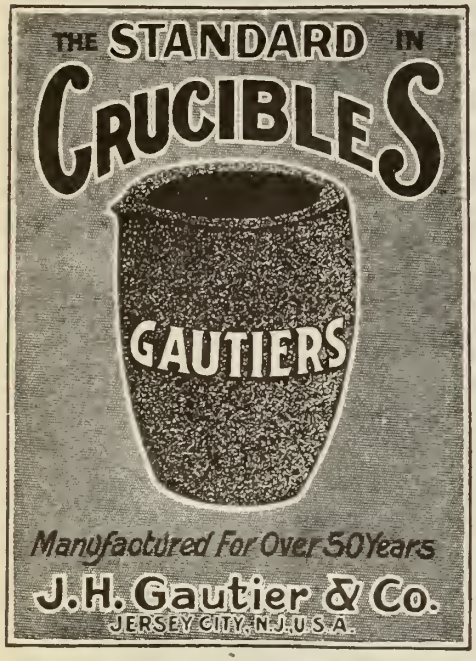

be ground better and cheaper mechanically than by hand.

This point being accomplished, a systematization of work was begun. When a tool was adopted as a standard to be kept in stock, it was given a number and a tracing made of it for the producing of blue prints to compose a file of the growing list of standard tools.

One tool stock room supplies the three tool cribs. From these cribs tools are checked out to the workmen and are to be returned as soon as their job is done. This does away with the old method of each workman keeping an unnecessary amount of tools at his machine, a system which is very costly. Each department is equipped with an emery wheel stand to be used in resharpening tools while in use, this being the only grinding done in the machine shop as all tools are shaped up and ground when they are checked out to the workman.

When a tool is broken or ground beyond resharpening, it is turned back to the crib and replaced by a new tool. These broken or worn tools are kept in a place by themselves in the crib until they are collected by the tool supervisor who has them salvaged by being reforged into some other tool using a lesser amount of steel or welded onto carbon steel shanks.

Tools that have been reforged and ground away until they are about four inches long are considered ready for the electric welder where they are welded onto carbon steel shanks in an electric butt welder. Very little has been written about this method of salvaging tools and from what data has been gathered in the past year or so, we find that very few firms have taken up this method of salvaging worn out turning tools, crop ends of bar stock, etc. Before going into the cost of salvaging this steel by welding, it might be well to explain the method used in preparing tools and shanks for welding.

Preparing for Welding

We will take for example a piece of high speed steel ¾ x 1 x 8 inches long, which length represents the majority of our tools. Of this length, approximately 4 inches is used, leaving 4 inches, which if not suitable for reforging into some other tool formerly was sold for scrap. At the length of four inches the average tool is of no further use as it cannot be held successfully in a tool post or other clamp while in use. These scrap or crop ends are taken to the blacksmith forge where the forged end is cut away with a hot chisel. Then it is taken to a grinder where the ends are ground at right angles with the sides. It is now ready for being welded to a carbon steel shank, which shank is made from 0.25 to 0.35 per cent. cold-rolled carbon steel.

PLATING SOLUTION

In a recent paper, No. 190, issued by the Bureau of Standards the following black nickel plating solution is given:

	oz./gal.	g/l
Nickel ammonium sulphate..	8	60
Zinc sulphate	1	7½
Sodium sulphocyanate	2	15

It is stated that numerous formulas have been proposed for the production of "black nickel" deposits such as are used extensively for producing a dark or black finish upon brass or other metals. Two types of solutions have been used, namely, the alkaline, cyanide solutions and the neutral sulphocyanate solutions. Experiments showed that the former were very difficult to prepare and maintain of uniform composition, and therefore they cannot be recommended. It was found that a sulphocyanate solution having the composition shown above was satisfactory.

It is desirable to keep in suspension an excess of zinc carbonate, which maintains the neutrality and the zinc content of the solution. "Black nickel" plating may be applied successfully to brass, either directly or after copper plating, to copper, and to steel which has been first coated with copper, nickel, or zinc. Where protection against corrosion is desired, the "black nickel" should be preceded by zinc plating. The wearing properties of the "black nickeled" surface are largely determined by the quality of the lacquer subsequently applied.

Why Don't You Write?

HARDLY a week passes that "Canadian Foundryman" does not receive copies of this paper returned by the postal authorities because of the change in firm names or the address of some whose names are on the mailing list. Sometimes complaints reach us of the non-delivery of mail matter. It is not till the receipt of such complaints or the return of the paper, as the case may be, that we obtain any knowledge of the changes or removals of persons or firms. The adoption of the co-operative spirit on your part by notifying changes would make things a good deal more pleasant for both parties. The MacLean Publishing Co. want their mailing list to be perfect—without your help perfection is impossible. There is a lot of valuable trade matter mailed by this company and if you don't receive it—well, the fault is entirely yours.

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Sand cut with a Whiting Machine does not have to be riddles before using. It is ready to go into the molds just as the machine leaves it. This permits molders to devote all their time to making molds and greatly reducts foundry costs.

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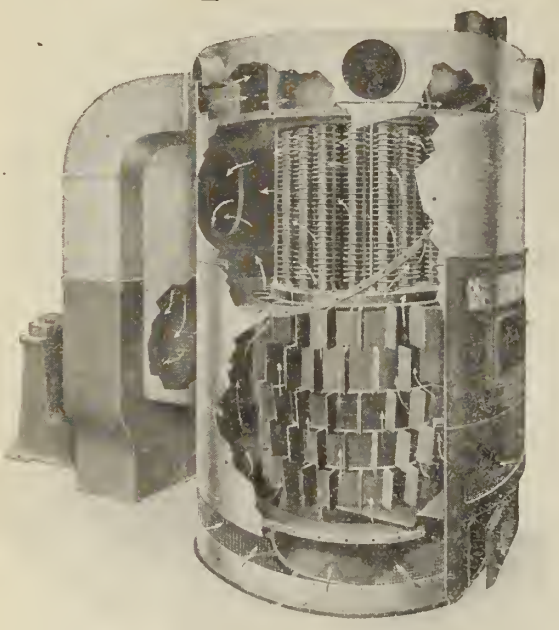

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PRESSURE SEATED AIR VALVES

"The Valve That Never Leaks"

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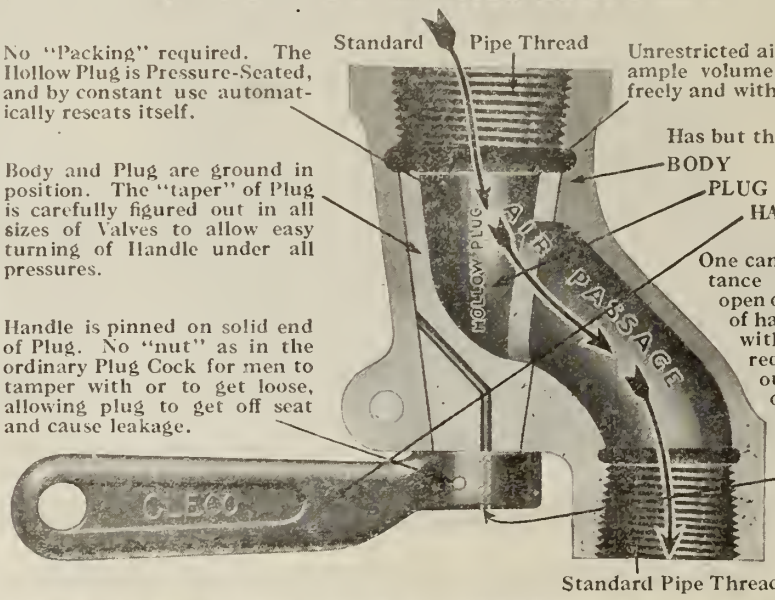
Style L.W.

Style F.W.

No "Packing" required. The Hollow Plug is Pressure-Seated, and by constant use automatically reseats itself.

Body and Plug are ground in position. The "taper" of Plug is carefully figured out in all sizes of Valves to allow easy turning of Handle under all pressures.

Handle is pinned on solid end of Plug. No "nut" as in the ordinary Plug Cock for men to tamper with or to get loose, allowing plug to get off seat and cause leakage.



Unrestricted air passage allows ample volume of air to pass freely and without friction

Has but three parts:—
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PLUG
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One can "See" from a distance if Cleco Valve is open or closed by position of handle. Other makes with "Wheel" control require a visit to find out if Valve is fully open or partially so. Why waste time?

Waste Port which permits the air in Hose to escape to atmosphere when Valve is closed.

"The Valve That Improves With Use — Requires No Attention After Installation"

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THE Dings Magnetic Separator is seen separating iron and steel from copper and bronze turnings and borings at the Canadian Westinghouse plant, Hamilton, Ont. The foundry superintendent and operator of the **Dings** speak enthusiastically of the work the machine is doing here. "Westinghouse" is a name that stands for high-grade electrical equipment. Only pure metals enter into Westinghouse products, and it is a distinct tribute to the merits of the Dings Magnetic Separator in the satisfaction it is giving at the Westinghouse plant.

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Head Office and Works:

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Registered U. S. Patent Office

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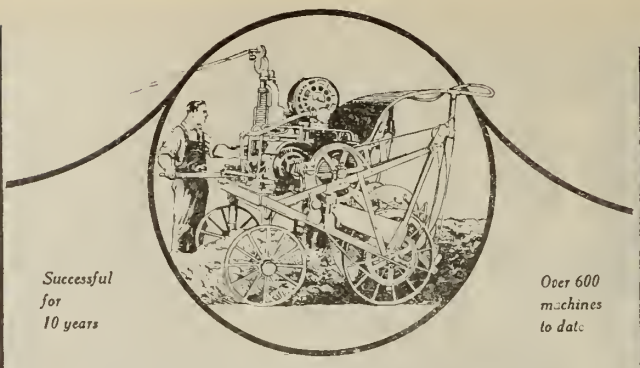

Successful for 10 years

Over 600 machines to date

AFTER

The Sand Cutting Machine cuts a 90-foot pipe floor in 4 minutes. Cuts an ordinary floor in 1 minute. Piling —3 to 5 minutes.

The saving in labor is enormous. Smoother castings. Fewer blows. Less scrap. Molders spend entire time on productive work.

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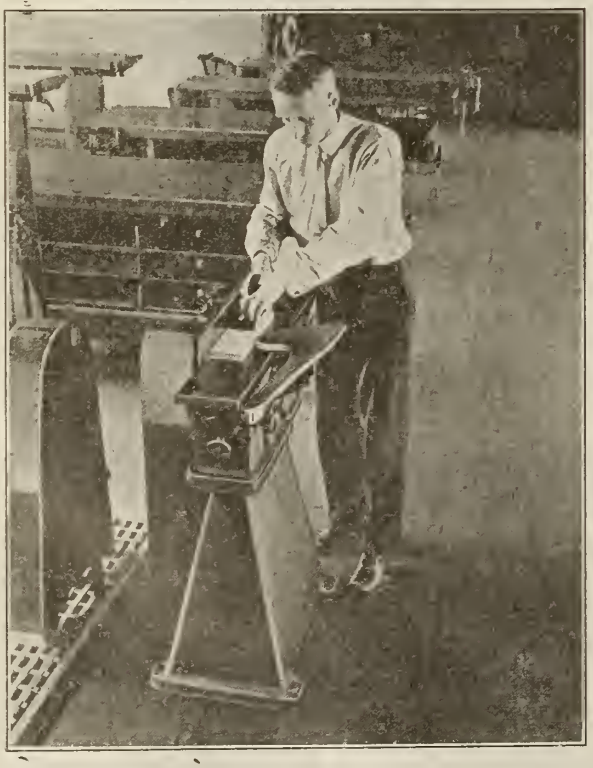
EQUIPMENT

Member of Foundry Equipment Manufacturers' Association

This "Oliver" No. 144 6-inch Jointer



installed in your pattern or wood shop will straighten up and joint more in two minutes than you can plane by hand in two hours. It will do it better too.

"Oliver" Jointers are made in 6", 9", 12", 16", 20", 24" and 30" sizes.

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Pattern Shop Equipment
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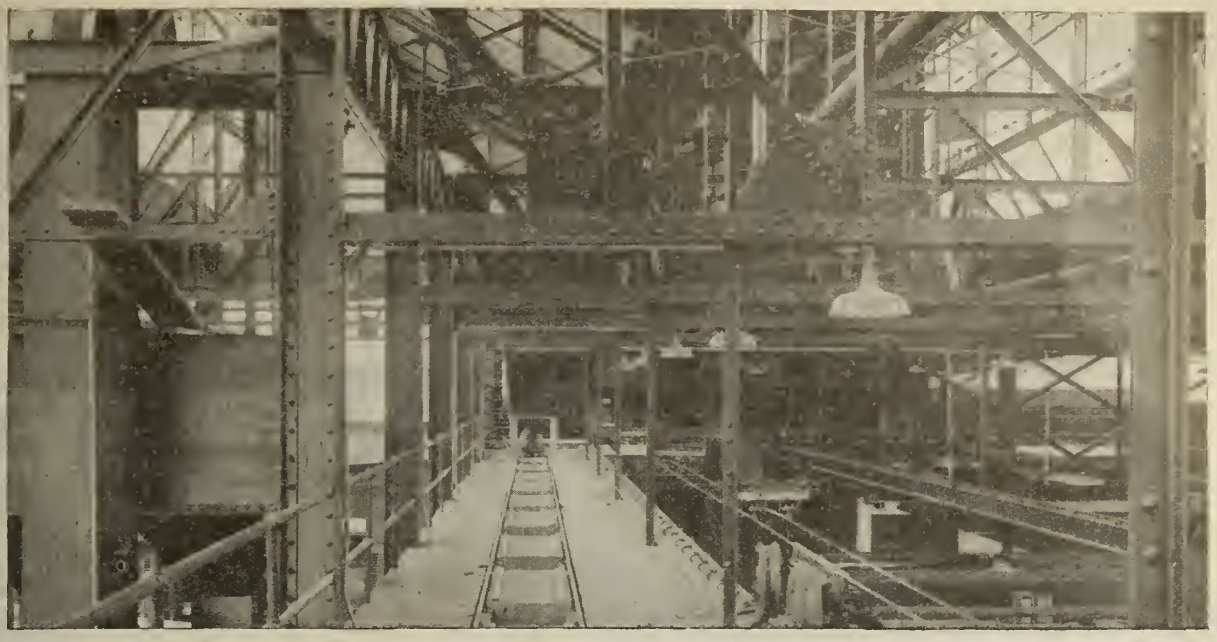

Interior view of a recent Lane-designed Foundry

A Component Part of a Lane-Designed Foundry (Machine)

Note how well-lighted this plant is (the photograph was not retouched in any way). It is just as efficient in the matter of ventilation.

This foundry was "made to order" in the typical Lane way. The many innovations and features of construction and equipment we culled from hundreds of others which our broad and diversified experience has taught us, with the result that this plant will operate as a veritable machine for the production of the castings it was designed to turn out.

The above view shows a sand delivery gallery over a row of sand bins supplying the molders below.

Call, write or wire for information and advice on any foundry construction or reconstruction problems you may have in mind. You will be placed under no obligation whatsoever.

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Industrial Engineers and Foundry Specialists

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Canadian Office: The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.

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We are in a position to make Prompt Shipment on all orders of Ladle Bowls, Shanks, Steel Bands, Steel Slipover Jackets, Steel Core Plates, Tote Boxes, Tote Barrels, Wooden Snap Flasks.

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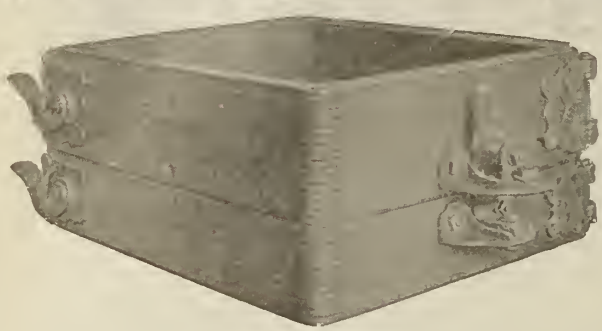
Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London, S,W., Eng.

DIAMOND

MASTER FLASK



Diamond Master Flasks are light in weight, easy to handle, accurate and very durable. Their convenience and accuracy result in a larger and better production. Let your next order stipulate Diamond Master Flasks.

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On account of demand this Season for our Sands we are placing a practical Moulder, anexpert on grading sands, in charge on June 10th, and will guarantee every car shipped to our customers, satisfactory, or will make no charges. Is this not a fair proposition?

Send us your requirements, stating class of work—Brass, Aluminum, Malleable, Stone Plate, Etc., and we will quote you a special June and July price.

We want you as a satisfied customer. and will give you prompt delivery and excellent grade of Sand. Write today.

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LIMITED.

Brockville, Ont.

WHO AM I?

Some foundrymen liken me to a wild west bucking bronco — while those who understand me, say I am the very best friend a foundryman ever had when he treats me right, but his worst enemy when he lets some ignoramus ruin my very vitals with his nauseating mixtures.

My *friends* do not stuff me full of vile, rotten materials—then physic me with limestone or other laxative, and expect fine castings. They are human and know they cannot make apple pies out of turnips.

I have nearly exploded when some roughneck Bolsheviki filled me full of sand, dirty scrap, limestone, etc., then teased me with a little piece of manganese or perhaps some fakey alloy wrapped in paper, and expected good iron.

I frequently wonder how long men can repeat that performance day after day and get away with it. It seems to me that some men have oodles of money for stuff to throw into me or the ladle, but not one dollar for something to put under their hats. You know where I mean; where their brains ought to be.

While I am no knocker, still the next big stiff that chokes me with sulphur fumes will get a bad drop and that's no joke.

Although *Whiting* formed me gradually from a sheet of steel and cast iron many years ago, *I am the least understood piece of equipment in this plant.* Wise boys who pose as expert foundrymen pass me up with the remark: "Let George do it. I told him how." Can you beat it?

Would you believe they feed me more $20-per-ton-coke than they did when it was $6 per ton? The excess coke fills me full of carbon monoxide which nearly chokes me, and cuts my efficiency 50%. Won't they ever wake up? We iron eaters need CO_2 in right quantities —then we'll melt hotter iron than electric furnaces.

McLain told them how to doll me up and here I am, a perfect 36, melting more semi-steel than the big 54″ across the way. McLain men jolly me along in a nice, easy manner; they don't run the blast, howling, rushing madly through one like a cyclone, producing CO instead of CO_2.

For the love of Mike keep steel scrap out of me unless McLain and Manganese are on the job, otherwise the semi-steel is a misnomer or *worse than that.*

I Am The Cupola--"The Heart of the Foundry."

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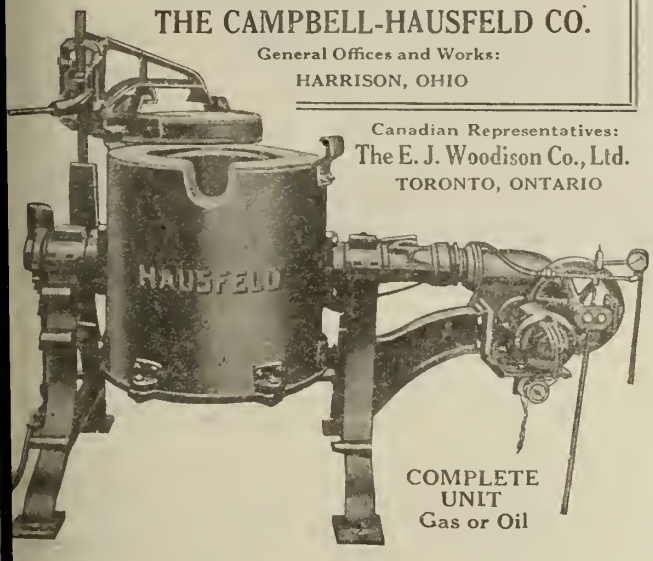

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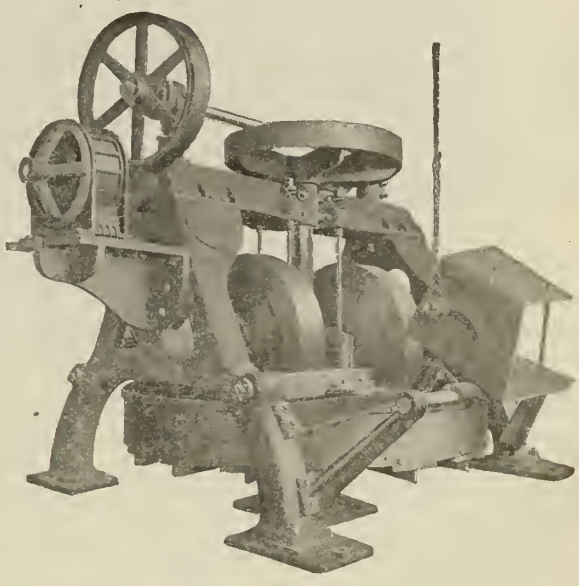

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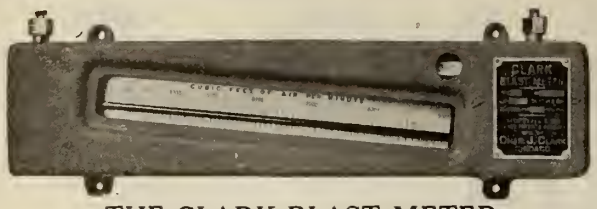

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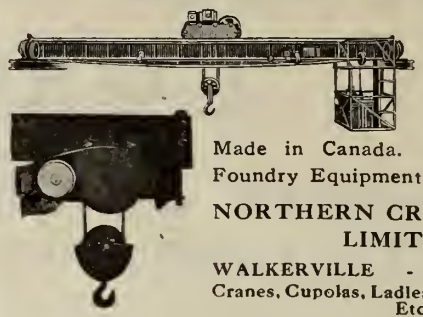

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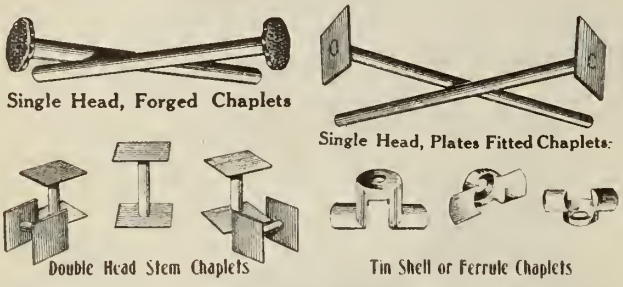

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They machine faster with less tool expense and paint, plate or galvanize with a better and more lasting finish.

With the right equipment Sand-Blasting cleans them cheaper. "Pangborn" Sand-Blast Equipment meets every need and pocket-book.

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40 x 4 = 160 lbs.
160 x 75 = 12,000 lbs.
12,000 lbs. = 6 tons

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STEVENS NO. 510 PLUMBAGO

gives you old fashioned, pure-quill Ceylon quality, and the best possible service, and "conservation" is exercised in the price.

There is "conservation" all around, in Ceylon quality while it lasts, and in money which you will need for taxes, for the tax collector is abroad in the land.

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Canadian Branch: WINDSOR, ONT.

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

Vol. XII Publication Office, Toronto, July, 1921 No. 7

WHITEHEAD'S ALBANY SAND

We are the original producers and largest shippers from the Albany and North River Territory.

Over seventy years' experience in the selection, production and distribution of dependable moulding sands.

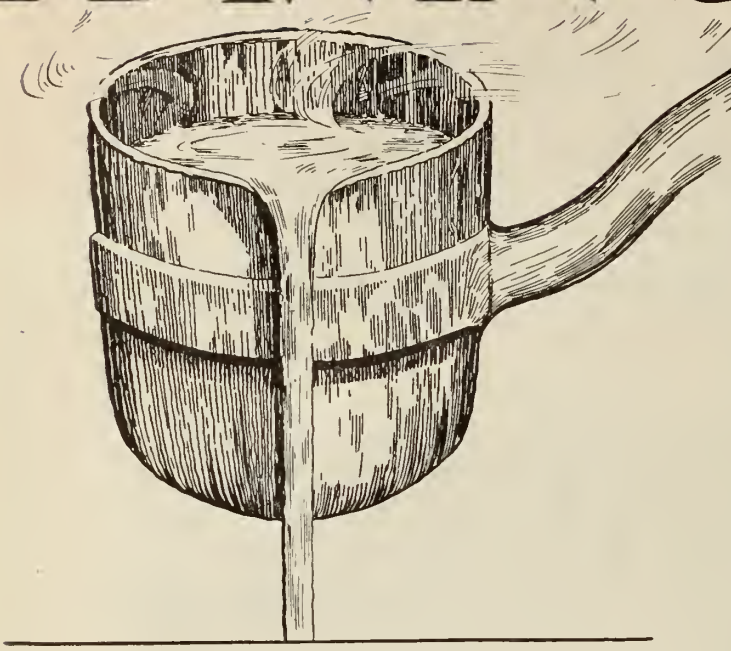
Write for "Albany Sand" Booklet

WHITEHEAD BROTHERS COMPANY

Providence NEW YORK Buffalo

Established 1850

KAWIN SERVICE



A ship when coming into port takes a pilot on board. The captain realizes that no matter how great is his seamanship he does not know the ports at which he calls as well as the pilot.

So with your foundry. A foundry owner, no matter how capable, can not know **all** the branches of his foundry practice as well as men who specialize—each in his own particular branch.

This is why Kawin Foundry Service has proved of such inestimable value to Canadian and American Foundrymen.

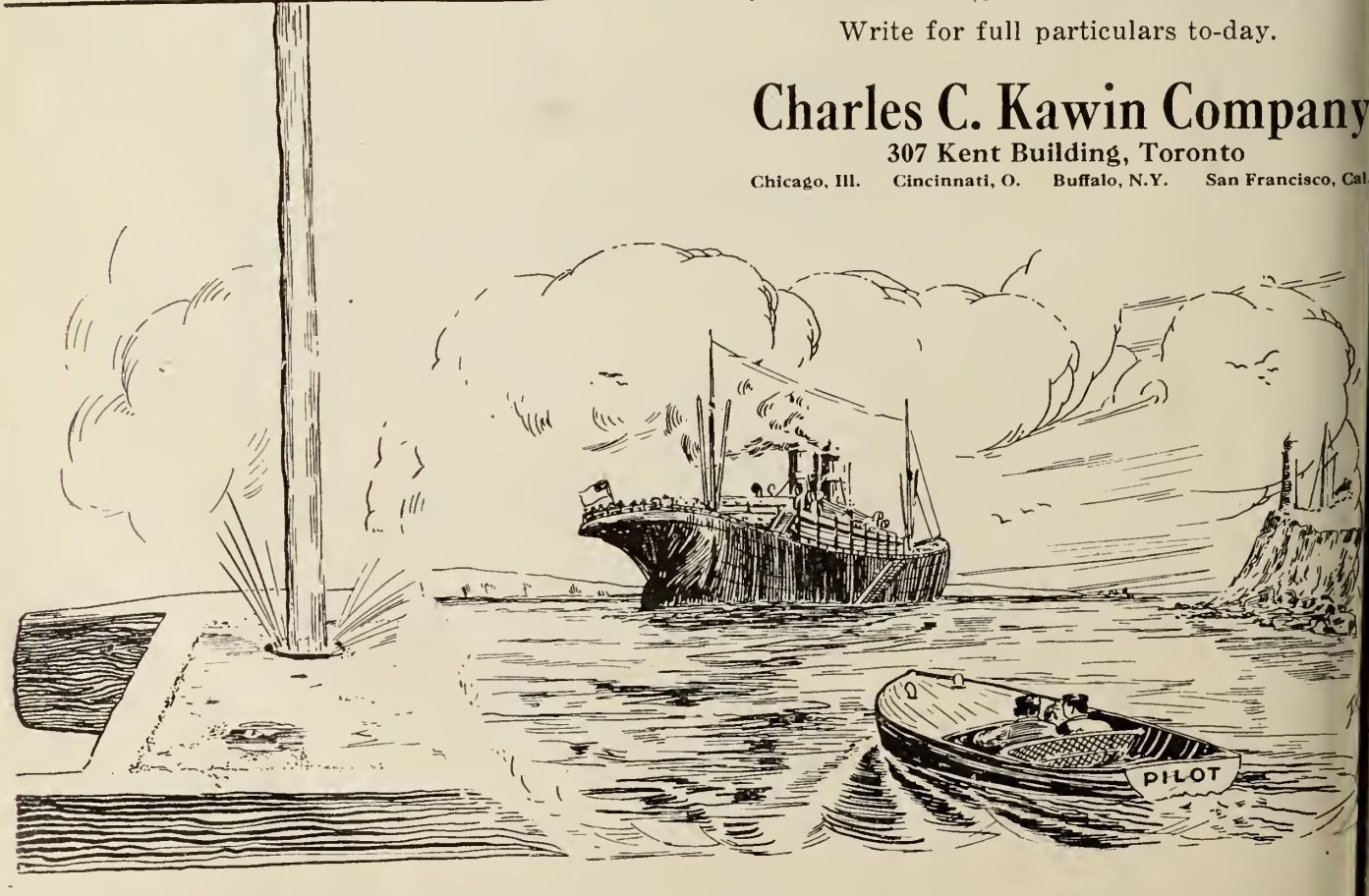
The Service consists of capable, highly trained men, each of whom has learned his own particular branch of foundry practice —both practical and theoretical—from the bottom to the top.

Because experience has proved just what Kawin Service can accomplish in a foundry, we are able to **guarantee that our service will save you at least 100% over and above its cost!**

Write for full particulars to-day.

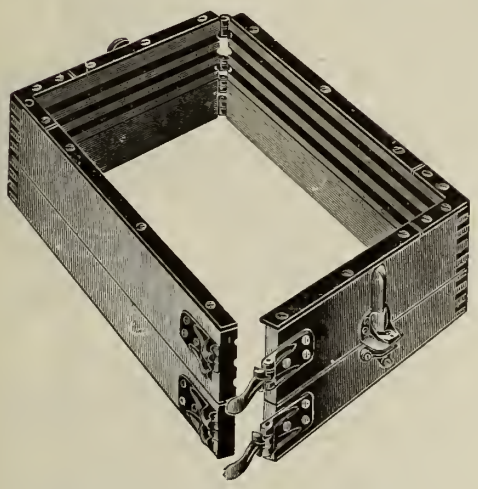
Consider your foundry as a ship— and Kawin as the pilot.

Charles C. Kawin Company
307 Kent Building, Toronto
Chicago, Ill. Cincinnati, O. Buffalo, N.Y. San Francisco, Cal.

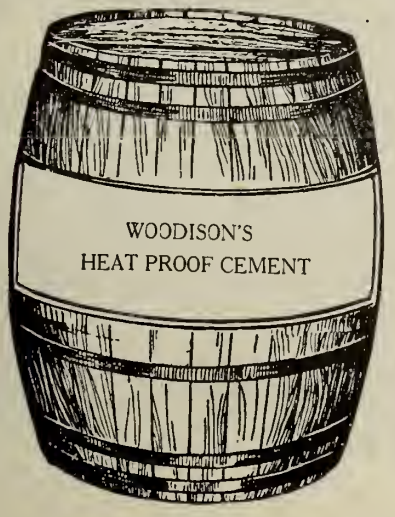


Here's a Little Fact
Some of You Chaps May Have Overlooked--

Steel Bands



Hardwood Snap Flasks



Every "Woodison" Purchase is accompanied by an Unconditional Guarantee.

No matter what your work is, it has to give you long and efficient service or you get your money back. Keep this in mind when you need--

Steel Bands

The steel bands are for ramming up in the mold. In ordering give size of flask parting. Our standard is to make the outside of the band ¼th smaller. This allows it to drop easily and ram out tight against the flask and hold it.

Hardwood Snap Flasks

Woodison flasks are strong and durable; there is no danger of their springing and making a shift in your castings. Snaps are quick-acting, hinges fit snugly and work easily. Standard sizes and shapes made promptly to order.

Flat Bottom Welded Steel Bowls

These Bowls have heavy steel plate sides and head. Capacities 50, 100, 150, 200, 250, 300, and 350 lbs. or larger. When ordering ladle bowls, state inside diameter of shank ring that they are expected to fit.

Woodison's Heat Proof Cement

This plastic asbestos compound sets hard as a rock and is absolutely heat resisting. Used extensively for: Boiler Settings, Bridge Walls, Boiler Arches and Fire Door Linings, Annealing Furnaces, Billet Heating Furnaces, Case Hardening Furnaces, Enamel Furnaces, Brick Kilns, Forge Furnaces, Heat Treating Furnaces.

Flat Bottom Welded Steel Bowls

THE E. J. WOODISON CO.,
LIMITED

Foundry Requisites, Firebrick, Fireclay and Equipment

TORONTO, ONT.

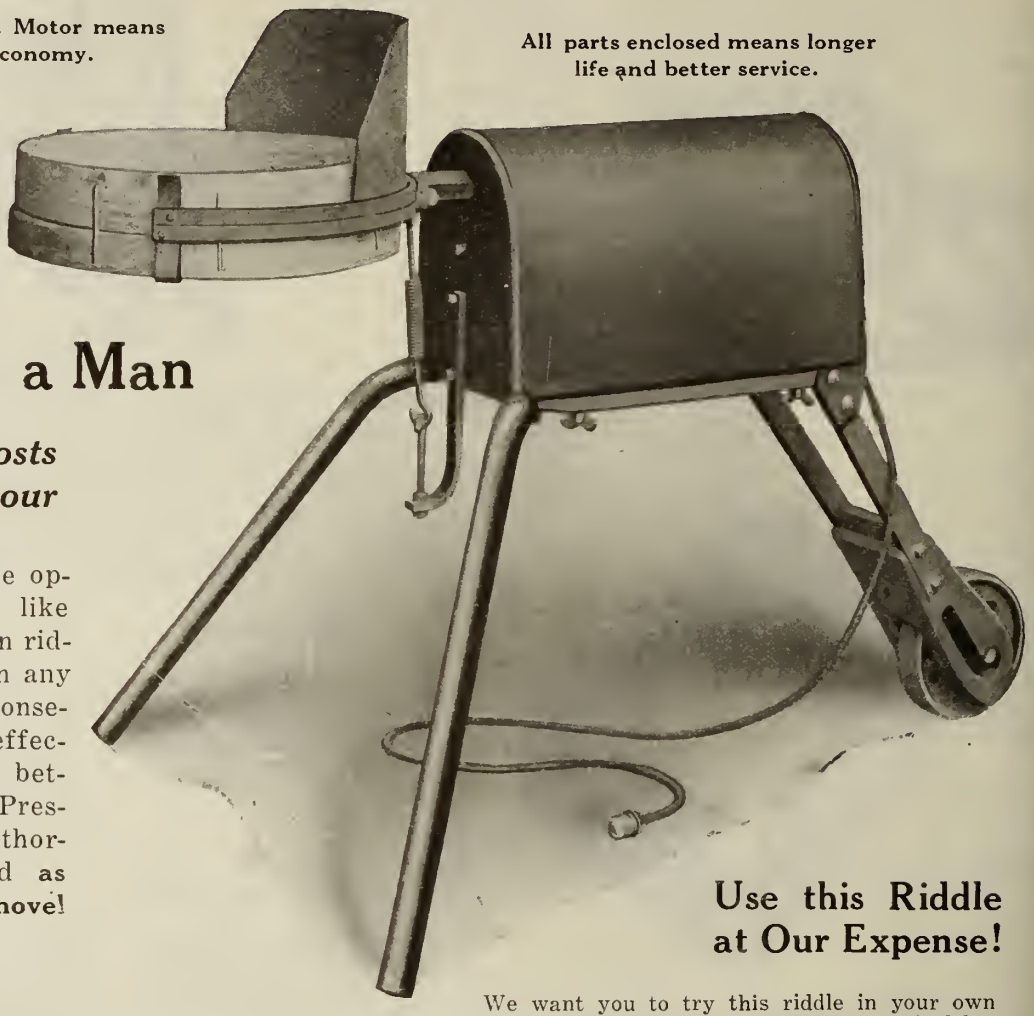
Branch and Warehouse at 261 Wellington St., W. MONTREAL, P.Q.

The **PRESTON**

BALL-BEARING ELECTRIC SAND RIDDLE

Small ¼ H. P. Motor means power economy.

All parts enclosed means longer life and better service.



Riddles Sand Just Like a Man

--but it only costs a cent an hour

The Preston Riddle operates more nearly like the action of a man riddling by hand than any other made. Consequently it is more effective and produces better work. The "Preston" will produce thoroughly sifted sand **as fast as a man can shovel it in.**

Use this Riddle at Our Expense!

We want you to try this riddle in your own plant, under your own conditions. Don't delay about filling in and mailing the form below.

Push it Anywhere

The great value of the "Preston" is in the fact that it can be moved anywhere —easily and quickly. It is equipped with handles to make moving simpler. The Preston has large capacity, totally enclosed motor and takes the standard 18" Hand Riddle used by moulders.

The Preston Woodworking Machinery Co., Limited.
Preston, Ontario.

Gentlemen:—

Please ship us (me) on 15 days' trial by.....freight prepaid one "Preston" Ball Bearing Electric Sand Riddle for .... cycle .... volt current.

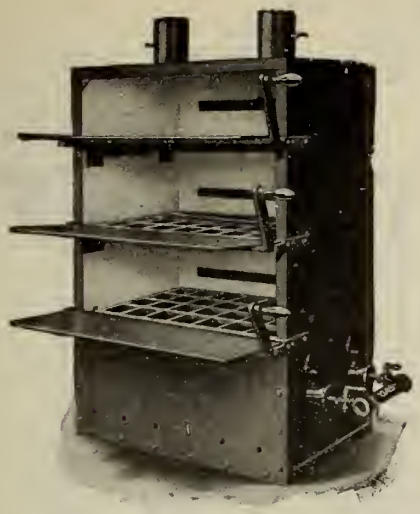
At the end of the above trial period I am (we are) privileged to return the riddle if not satisfied in every way.

Name .....

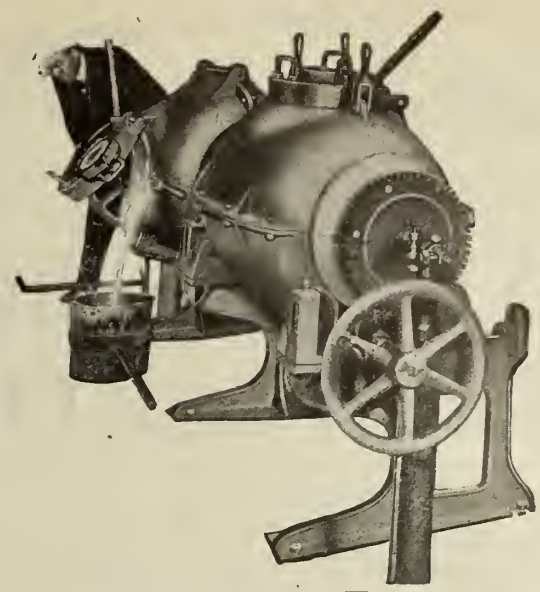
Address .....

The Preston Woodworking Machinery Company Limited

PRESTON, ONT. CANADA



Monarch "ARUNDEL" Drop Front Core Oven — Any Fuel



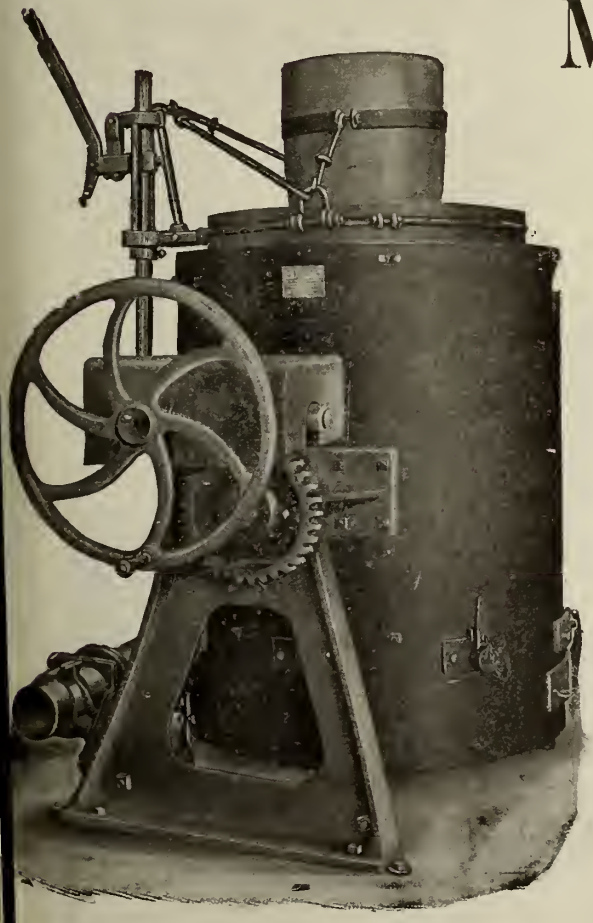
The Monarch Rockwell Double Chamber Melting Furnace.

Cutting out the Time Losses —

Employees' time is perhaps the biggest casting cost. Slow heating furnaces mean **wasted** time. Use

MONARCH

MELTING FURNACES



Tilting Crucible Coke Furnace

The Monarch Rockwell Double Chamber Melting Furnace melts almost twice as much metal as any other furnace because it utilizes all the heat from its one burner. While melting in one chamber exhaust heat brings the metal in the other chamber to the melting point. It requires no crucibles and burns either oil or gas. For speedy economical melting, this furnace has no equal.

The Monarch Coke Tilting Crucible Melting Furnace is a fast economical melter equipped with Hopper Feed and Shaker Grates. Above ground and built for various size crucibles.

Being "Monarch Equipped" is only keeping up with Foundry Progress. You get the inside story in our catalogue.

No matter what type of Monarch Furnace you choose you're certain of superior results. Each style has many individual time and money saving features that prove splendid investments.

The Monarch Engineering & Mfg. Co.
1206 American Bldg. Baltimore, Md.
Shops at Curtis Bay, Md.

Sterling

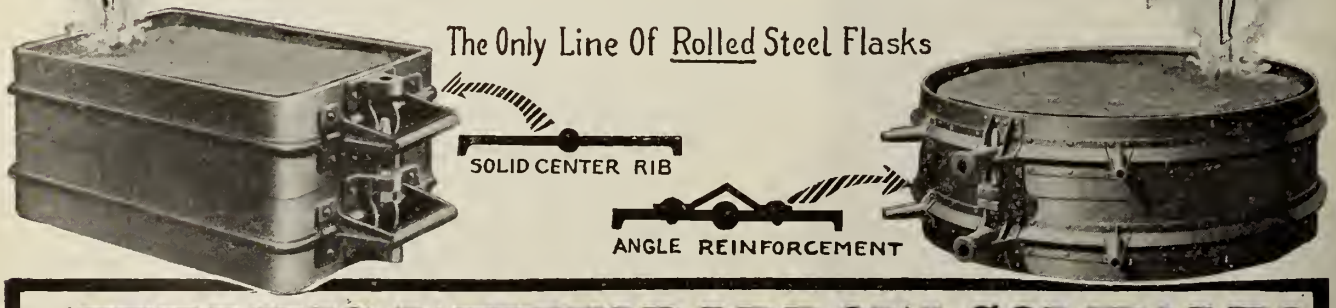
Who Accepts Your Steel Flask Orders?

Steel flasks are highly specialized.

Every order placed for Sterling flasks is personally passed upon by the President. Why? Because Sterling is zealous of its reputation as furnishing flasks suitable for the job. Might seem like menial work for the head of a big institution, but he says:

> "I can't hire any one that has had the necessary experience to assure that every buyer will be a satisfied customer."

Why take chances—better let the President of Sterling pass on *your* orders.



STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

NEW YORK
BOSTON
CLEVELAND

MILWAUKEE, WIS.

DETROIT
CHICAGO
ST LOUIS

CANADIAN AGENTS-MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VANCOUVER

Valvular Tank Trouble

WHEN oxygen tank valves leak—in transit or in operation—dollars are dissipated in the air instead of being pocketed by efficient welding or cutting work at the blowpipe tip.

Dominion Oxygen cylinders—like the product—are perfected in every detail. The Wedge Valve on a Dominion Oxygen tank cannot leak. It is the evolution of years of painstaking study, both in design and structural material.

Forged from bar stock, it resists the wear and tear of internal friction and if foreign matter, by any chance, score the face the valve re-seats itself while the tank is fully charged and in operation — a unique time and money-saving feature. And a twist of the fingers is all that is necessary. No tools are required.

This insurance against interruptions and failures has commended itself to all users of Dominion Oxygen. It also means that Dominion Oxygen reaches the consumer free from impurities and with cylinders filled to capacity—there can be no leakage en route or in application.

And with six centrally located distributing stations in full operation, the Dominion Oxygen Company, Limited, is prepared to supply consumers with any quantity of uniformly pure oxygen anywhere. Our policy of filling all orders on the day of receipt means the quickest and most satisfying oxygen service in the Dominion.

Dominion Oxygen Company, Limited

Hillcrest Park, Toronto

Hamilton Montreal Welland Windsor Merritton D19

Designed by The H. M. Lane Company

A Foundry Fit for Its Task!

A good many things must be considered in the evolution of a really modern and efficient foundry, and mere architectural treatment will not afford you such a plant. Neither will ordinary engineering ability solve your problems and enable you to produce efficiently and economically.

Lane service is the result of years of foundry experience and intensive application to the solution of its problems. It is a superior service because of its thorough and comprehensive knowledge of the structural and mechanical requirements for the production of any particular type of castings.

In addition to planning new ones, a good deal of our work consists in improving existing foundries or departments.

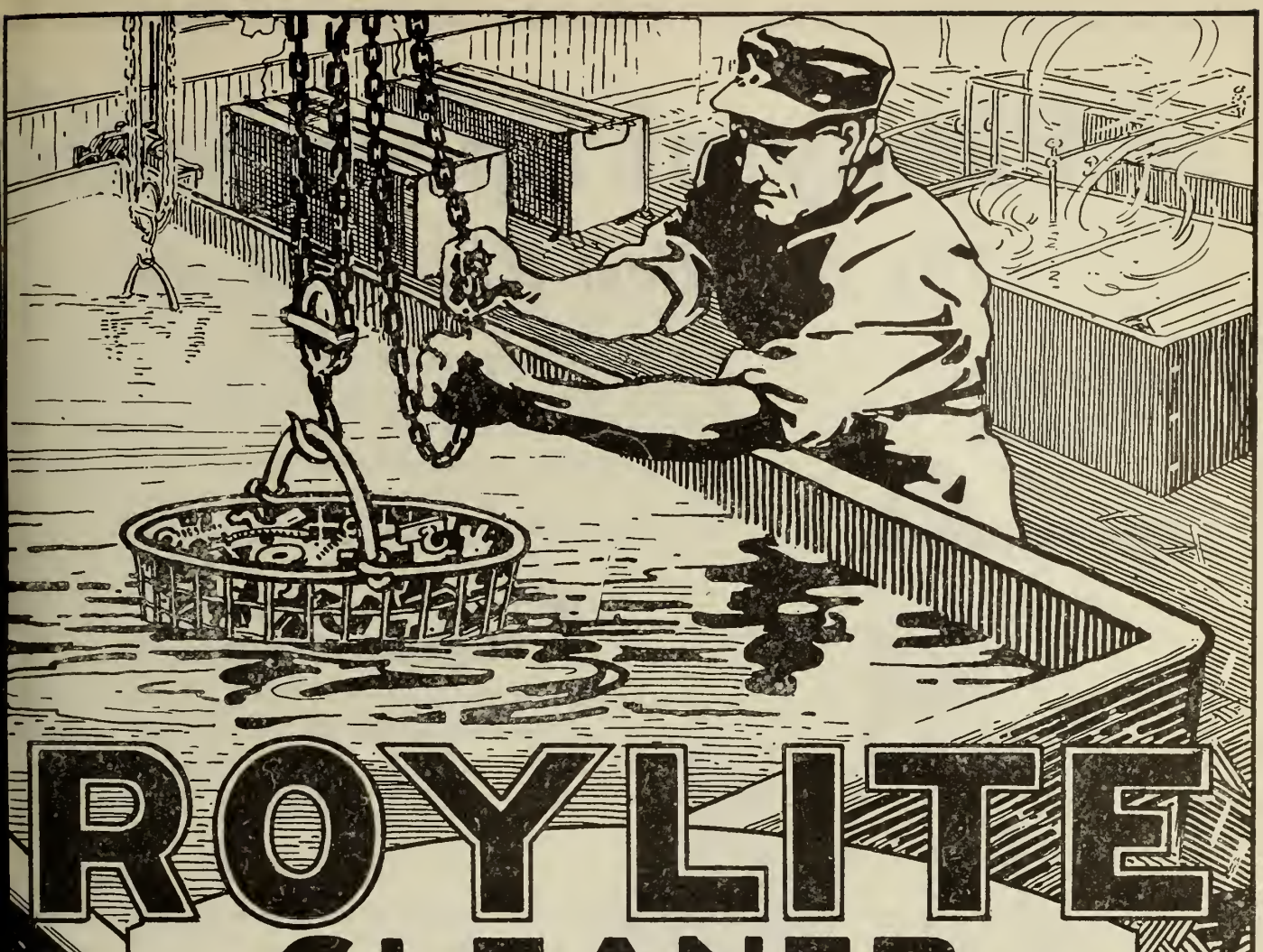
Let us help you, whether you need a new foundry or more efficient operation in your present plant.

THE H. M. LANE COMPANY

Industrial Engineers and Foundry Specialists

OWEN BUILDING, DETROIT, MICH.

Canadian Office: The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.



ROYLITE CLEANER

A New Discovery!

ROYLITE Cleaner represents the very latest and most successful development in the process of chemically removing oil, grease, enamel, paint or any kind of dirt from metal in the quickest and most thorough manner.

Formerly most cleaning solutions consisted of caustic soda, potash or lye which saponified grease and acted like a soap. The alkali strength was quickly used up because the action caused a precipitate and heavy sediment formed at bottom of solution.

The new Roylite process emulsifies mineral oil and heavy greases which cannot be saponified, by lifting them from the work to top of solution, thereby avoiding the precipitate action, making it unnecessary to throw out solution but merely add small quantities to sustain its strength.

Guaranteed not to discolor or tarnish the brightest surface.

Our men will gladly give you demonstrations. Order a barrel to-day on approval.

Lasts longer — Works quicker — Costs less

Manufactured by

CANADIAN HANSON & VAN WINKLE CO. LTD.

TORONTO, ONTARIO

"MADE IN CANADA"

CLEANS ALL METALS

Plenty of Speed with

The Handiest Riddle Made

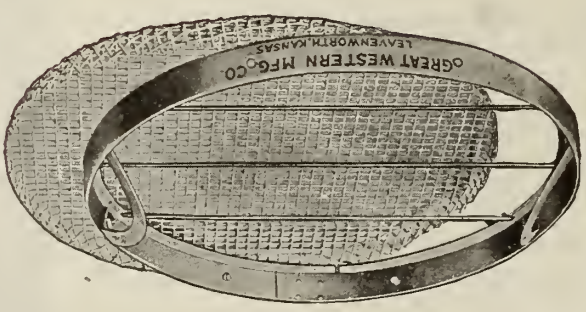
Sifts More Sand at Less Expense

With a *Comb's Riddle* all the molder has to do is to shovel in the sand and in a tenth of the time ordinarily required he will have all the thoroughly sifted sand he needs. The *Comb's Riddle* is convenient, and because it is convenient it is speedy. It will do the work of ten men. It will sift sand faster than a man can shovel it.

Run a Wheelbarrow Right Under It

—that's what you can do with the *Comb's Riddle*. You can mix your sand anywhere you like. It's portable and only weighs 98 pounds. When the plug is placed in a convenient socket it is ready to supply as many as twenty men with sand.

And it *mixes* as well as sifts sand. It is a producer of evenly mixed and tempered sand which insures a better mold with fewer patches. All at a cost of a few cents a day for electric power.



Every Comb's Riddle is equipped with a heavy steel sieve. This is held in place by an improved clamping device which enables the operator to remove, dump and replace in a second.

The Comb's Riddle is a compact, sturdily designed machine which operates with a true gyratory motion. This motion is not only speedier and easier on the machine but it actually gives it double the capacity of any other reciprocal machine of the same size.

The Comb's Riddle is made in Toronto under Canadian Patents. *You can buy it with Canadian funds and save exchange.*

Great Western Manufacturing Company

Leavenworth, Kansas

Comb's Gyratory Riddle

1—The design is simple and compact.

2—The frame is more rigid and strong.

3—Only one bearing outside the motor.

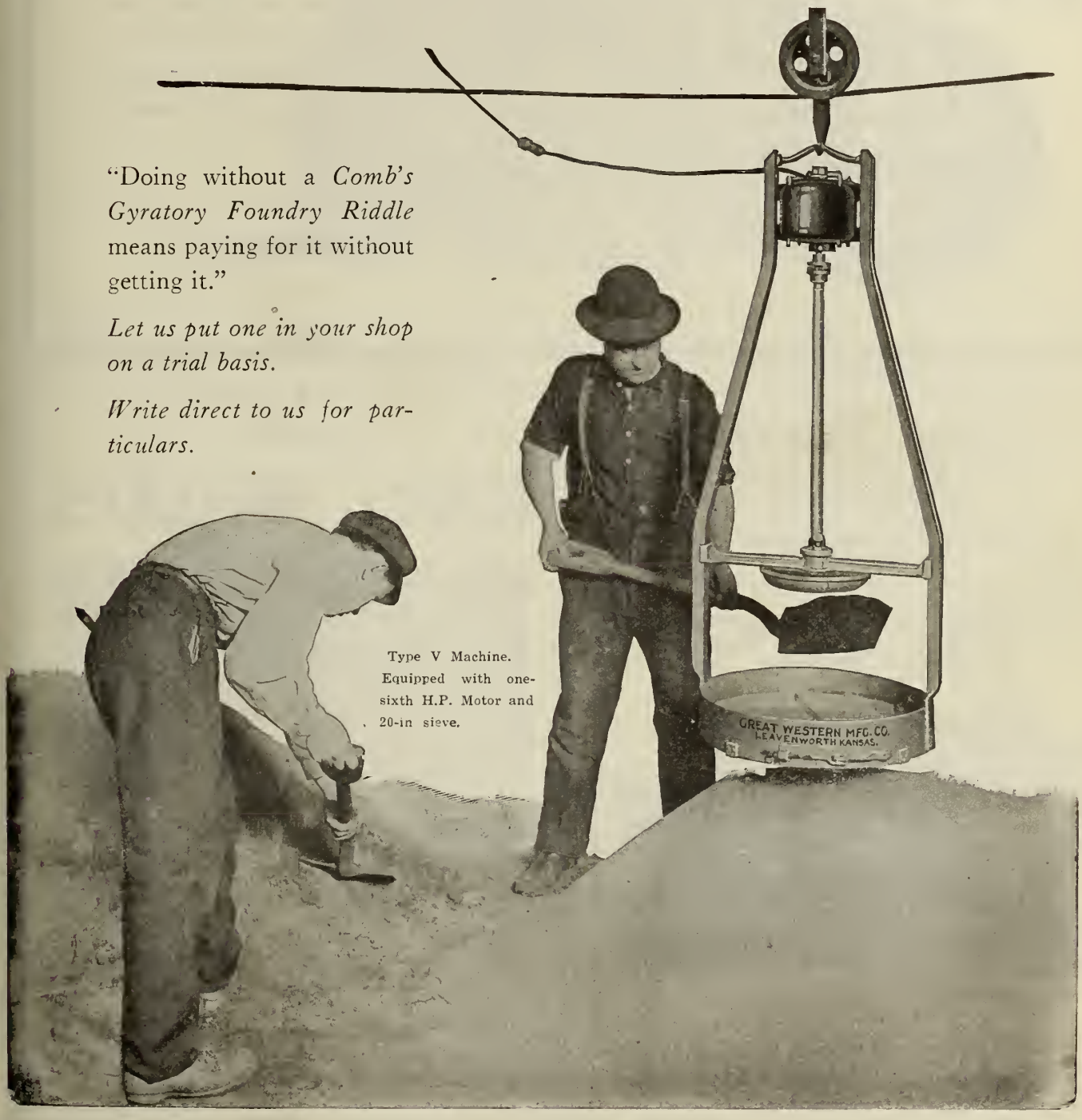
4—Totally enclosed motor, all bearings dust-proof.

5—There are no gears to require attention.

"Doing without a *Comb's Gyratory Foundry Riddle* means paying for it without getting it."

Let us put one in your shop on a trial basis.

Write direct to us for particulars.



Type V Machine. Equipped with one-sixth H.P. Motor and 20-in sieve.

"HAMILTON"

PIG IRON

THE STEEL COMPANY OF CANADA LIMITED

WE absolutely guarantee the quality of "HAMILTON" MACHINE CAST FOUNDRY AND MALLEABLE PIG IRON because we control its production from the mines to the finished product.

Iron Ore and Coal from our own mines; low sulphur By-Product Coke produced at our own plant. All pigs are machine cast and uniform in size, and, if desired, shipments can be made the day the order is received.

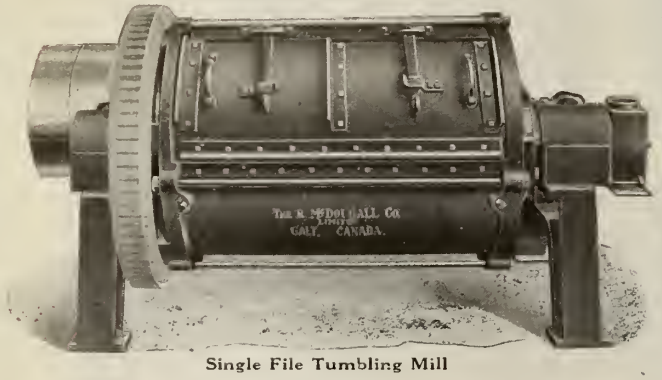
HAMILTON - MONTREAL

Exhaust Tumbling MILLS

Constructed of heavy steel plate

BUILT for long, heavy service, McDougall mills are in all respects high-class products. Equipped with renewable inside end linings, ring oil bearings and many other improved features.

Write for Literature.



Single File Tumbling Mill

Manufactured in Canada by

THE R. McDOUGALL CO., LTD.

GALT, ONTARIO

CANADIAN HART WHEELS

Our New Modern Plant

Fast-Cutting Quality

Sometimes you have a job where fine finish is the essential. Or again it may be speed you need. *In either case there's the right Hart wheel to do the job to perfection.* Hart wheels are built for better service and longer life. They prove their economy on every job.

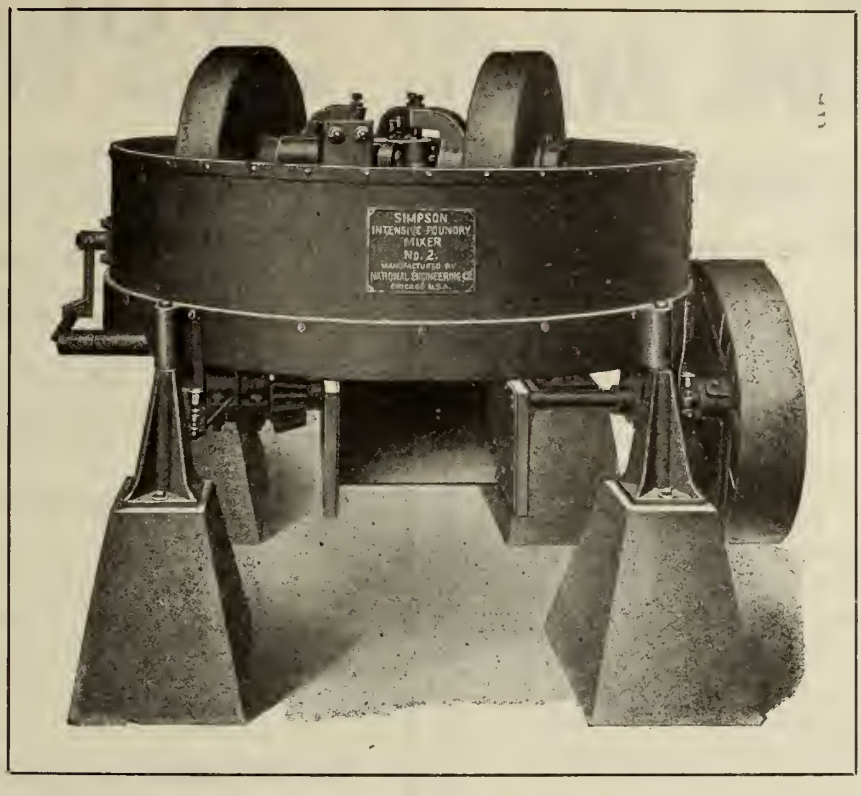
Send for our catalogue and let us help you chose the wheel you need. ***Write today.***

CANADIAN HART PRODUCTS, Limited

Successors to

Canadian Hart Wheels Limited

HAMILTON - - - ONTARIO, CAN.



Where Nature's Work is Improved

The Product of a Practical Foundryman

Sand—Nature's greatest gift to the moulder—requires additional attention before fit for his tools. By thoroughly blending and mixing this irregular product into a strong and plastic mass the SIMPSON INTENSIVE FOUNDRY MIXER improves on Nature's work—and gives to the Foundryman a highly efficient means of improving the quality of his castings with a minimum of labour and up-keep expense.

Prominent Canadian Users:

Canadian Westinghouse Co., Ltd.
Dominion Foundries & Steel, Ltd.
Canadian Pacific R. R.
Canadian Steel Foundries, Ltd.
Thos. Davidson Mfg. Co.
Dominion Bridge Co.
Robt. Mitchell & Co.
Ontario Specialties Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Dominion Iron & Steel Co.
Electric Steel & Metals, Ltd.
Canadian National Railway.
Crane, Ltd.

SIMPSON

INTENSIVE FOUNDRY MIXER

The Simpson Intensive Foundry Mixer is **"Economical and efficient for all kinds of sand mixtures in foundries producing steel, gray iron malleable and aluminum castings."**

Its performance is based on: correct size and speed of mullers; effective arrangement of plows; automatic discharge; large capacity per area of floor space; minimum power and maintenance; considerably less new sand and binder required.

Write for Pamphlet No. 50 and List of Many Users.

NATIONAL ENGINEERING COMPANY

Machinery Hall Bldg., 549 W. Washington St.
CHICAGO, Ill.

Buy Your
MOULDING SAND
In Canada
From the Government Tested
Brockville Deposits

THIS sand has been used since 1912 in leading foundries in Canada, and city of Detroit, and most favorably reported on.
For analysis and tests by the Mines Branch of the Dominion Government refer to Bulletin No. 21, 1917, where our Sand is placed in actual Foundry tests with Albany Sand and highly recommended.

On account of demand this Season for our Sands we are placing a practical Moulder, an expert on grading sands, in charge on June 10th, and will guarantee every car shipped to our customers, satisfactory, or will make no charges. Is this not a fair proposition?

Send us your requirements, stating class of work—Brass, Aluminum, Malleable, Stove Plate, Etc., and we will quote you a special June and July price.

We want you as a satisfied customer. and will give you prompt delivery and excellent grade of Sand. Write today.

THE BROCKVILLE MOULDING SAND CO.
LIMITED.

Brockville, Ont.

"VOLTA"
Electric Furnaces

ELECTRIC STEEL FURNACES
100 lbs. to 15 tons Capacity

GRAY IRON CASTINGS
Electric Furnaces for making Gray Iron

ELECTRIC BRASS FURNACES
Made in standard sizes of 1/8, 1/4, 1/2 and 1 ton capacity.

Electric Furnace Accessories of All Kinds

In order to meet and overcome strong competition you should reduce your production costs as well as metal losses. This can unquestionably be done by operating an electric furnace. Let us convince you that this is true.

The Volta Manufacturing Company, Ltd.
WELLAND, ONT.

Sand *plus* Service
When you Specify
VENANGO
MOLDING SANDS

The highest Quality Sand found anywhere plus a Service Department that analyzes and fills each order with scrupulous care---that's Venango.

Molding Sands for Steel, Malleable, Brass, Aluminum, Furnace and Light Grey Iron Castings. Also Core Sands.

Ask any user about Venango Sands. He will tell you our prices; quality and prompt deliveries relieve him from all sand worries. Send for samples now.

VENANGO SAND CO.
FRANKLIN, PA.

WHO AM I?

Some foundrymen liken me to a wild west bucking bronco — while those who understand me, say I am the very best friend a foundryman ever had when he treats me right, but his worst enemy when he lets some ignoramus ruin my very vitals with his nauseating mixtures.

My *friends* do not stuff me full of vile, rotten materials—then physic me with limestone or other laxative, and expect fine castings. They are human and know they cannot make apple pies out of turnips.

I have nearly exploded when some roughneck Bolsheviki filled me full of sand, dirty scrap, limestone, etc., then teased me with a little piece of manganese or perhaps some fakey alloy wrapped in paper, and expected good iron.

I frequently wonder how long men can repeat that performance day after day and get away with it. It seems to me that some men have oodles of money for stuff to throw into me or the ladle, but not one dollar for something to put under their hats. You know where I mean; where their brains ought to be.

While I am no knocker, still the next big stiff that chokes me with sulphur fumes will get a bad drop and that's no joke.

Although *Whiting* formed me gradually from a sheet of steel and cast iron many years ago, *I am the least understood piece of equipment in this plant.* Wise boys who pose as expert foundrymen pass me up with the remark: "Let George do it. I told him how." Can you beat it?

Would you believe they feed me more $20-per-ton-coke than they did when it was $6 per ton? The excess coke fills me full of carbon monoxide which nearly chokes me, and cuts my efficiency 50%. Won't they ever wake up? We iron eaters need CO_2 in right quantities —then we'll melt hotter iron than electric furnaces.

McLain told them how to doll me up and here I am, a perfect 36, melting more semi-steel than the big 54″ across the way. McLain men jolly me along in a nice, easy manner; they don't run the blast, howling, rushing madly through one like a cyclone, producing CO instead of CO_2.

For the love of Mike keep steel scrap out of me unless McLain and Manganese are on the job, otherwise the semi-steel is a misnomer or *worse than that.*

I Am The Cupola--"The Heart of the Foundry."

(Copyright 1921)

SEND FOR FREE SYNOPSIS

McLAIN'S SYSTEM, INC.

700 Goldsmith, Bldg.

MILWAUKEE, WIS.

McLAIN'S SYSTEM, INC., 700 Goldsmith Bldg., Milwaukee, Wis.
I am interested in:
Semi-steel [ ]
Gray Iron [ ]
Cupola Practice [ ]
STEEL
[ ] Crucible
[ ] Converter
[ ] Electric
[ ] Open Hearth
Name .....
Address .....
Firm .....
Position .....
6-21

NO 7 SCARFE'S CORE OIL

The best substitute for higher priced Linseed Oil,-no longer time required- and it is cheaper to bake.

Scarfe's No. 7 is a good strong oil used in proportions—50 to 1—with lake washed sand; it has a breaking strength of 22 lbs. per square inch.

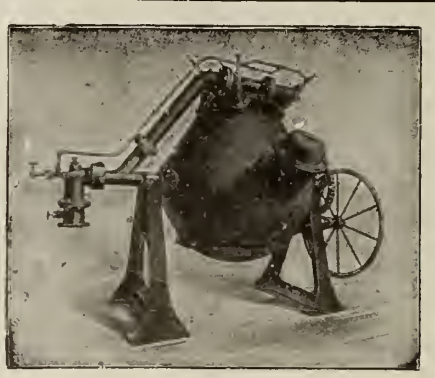
SPECIAL—Send us a sample of the sand you use. We will submit a core oil to give you better results.

SCARFE & COMPANY LIMITED

Makers of Industrial Varnishes and Paints for 44 years.

Head office: BRANTFORD, ONT. Branches: MONTREAL - WINNIPEG

Hawley-Schwartz



The Perfect Melter

BETTER melts, in less time and at lower costs, are the results that go with Hawley - Schwartz Melting Furnaces. They are economy producers in every sense.

THE Hawley - Schwartz heats uniformly and will handle all metal from 50 lbs. to 10,000 lbs.

Write for catalogue and complete information.

The Hawley Down Draft Furnace Co., Easton, Penn., U.S.A.

PIG IRON

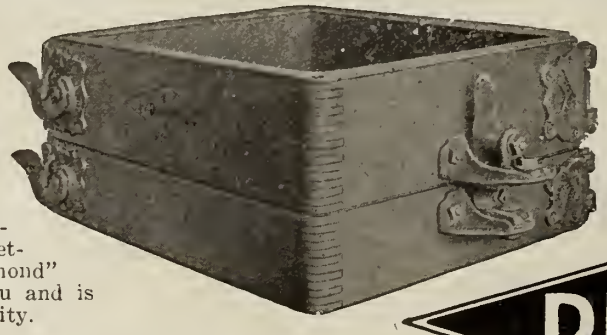
(ALL GRADES)

FERRO MANGANESE—FERRO SILICON

Stock and Import

A. C. LESLIE & CO., Limited, MONTREAL

MASTER FLASK



This is the handy Flask that up-to-date Foundries use for faster, better work. The "Diamond" trade-mark protects you and is your guarantee of quality.

MASTER FEATURES

Master Flasks are accurate, light in weight, and easy to handle.
Master Flasks are Speedy and durable.
They are wonderful economizers of floor space.

Specify "Diamond" next time.

Sold in Canada by

Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

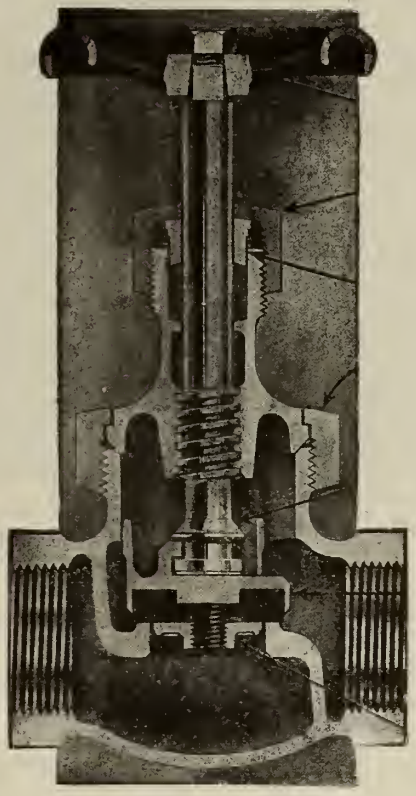
DIAMOND

DIAMOND CLAMP & FLASK CO.

40 N. 14th Street, RICHMOND, INDIANA, U.S.A.

SEVEN FEATURES OF THE CRANE NUMBER 7

for use in plants where continuous service is required and where discs must be changed quickly without injury to the valve.



1—Easily removable malleable iron, non-heat wheel

2—Malleable iron nut

3—Brass gland

4—Malleable iron nut

5—May be packed under pressure when valve is wide open

6—Removable disc holder for quick change

7—Removable nut for changing disc

Made in sizes ¼-to 2-inch; for 150 pounds steam working pressure; discs for steam, air and water supplied as ordered. Body, Bonnet, Stem, Disc Holder, Gland, made of Brass.

Fully described in Circular No. 1 which will be sent upon request.

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4

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The amazing ability of Skinner Bros. (Baetz Patent) Heaters to thoroughly heat large foundries, factories, and plant interiors is almost unbelievable. But we guarantee it—if a Skinner Heater ever fails it becomes immediately returnable to the factory at our expense and every dollar of your money will be refunded. The heater is portable—requires no special foundation—costs 15 to 50 per cent. less to install than any other system. Operating cost is equally low.

Find out more about this heater—if you wish we will send you names of users so you can make an independent investigation.

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The Fastest Machine for Light Snap Flask Work

Whether your light snap flask work comes in large or small quantities you will find this Tabor 10-inch Power Squeezer able to handle it *faster* than any other machine built. Designed for speed, efficiency and economical operation.

Tabor Power Squeezers WORK FAST and WORK ECONOMICALLY. .06 minutes is all the time required to bring up the head and squeeze the mold. Repair expense is practically nil. The Tabor 10″ type handles flasks up to and including 14 x 20 inches.

For Small Molds and Medium Sized Cores

3" Tabor Jarring Machine with 12" x 14" Table

A distinctive Tabor achievement which works with such consistency and is such a time saver that it has become almost a necessity to the up-to-date foundry. It is built in that strong, long lasting way which is distinctive of all Tabor products.

The Tabor line of foundry equipment is most Complete. Write for bulletin giving full particulars.

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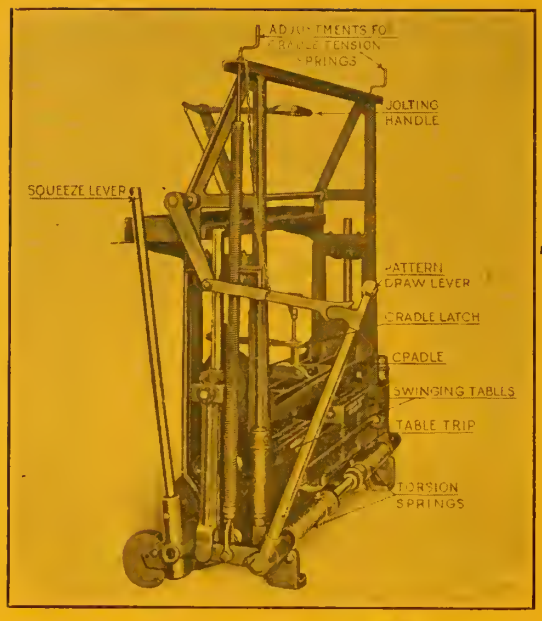

A Molding Machine anyone can use anywhere.

Costly skilled labor and keen competition

—have crystallized a demand for a simple, light running, hand operated molding machine that an unskilled man can readily master.

The American Machine No. 61 jolts, rolls over, squeezes, and draws the pattern, both cope and drag together. Don't confuse it with machines that perform only one or two operations. It does the entire job, giving a perfect mold, of uniform density and venting, without any hand ramming or tucking.

The skill is in the inexpensive pattern equipment, Costly metal patterns are not needed with this machine. Matches in American compound are easily made in your own shop, using your ordinary patterns. They are of unequalled accuracy because molded directly from the original pattern and there is no shrinkage.

American Pattern Compound and set of mounted matches.

Rolled Steel Flasks: You can "treat 'em rough"—they'll stand it. Light but strong. The corrugations greatly stiffen the flask, and hold the sand.
Any size—any pin—handles — trunnions — special styles.

Snap Flasks that cannot loosen or distort because each cope and each drag is a rigid one-piece aluminum casting. The five-degree taper replaces all hinges and latches. You just lift it off. Any depth; any size; rectangular or round.

An uncommonly good flask at a moderate price.

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366 Madison Avenue, New York

We Also Make—
Sand Blast Equipment — Sand Cutters
Core Machines — Dust Arresters
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EQUIPMENT

Snap Flask

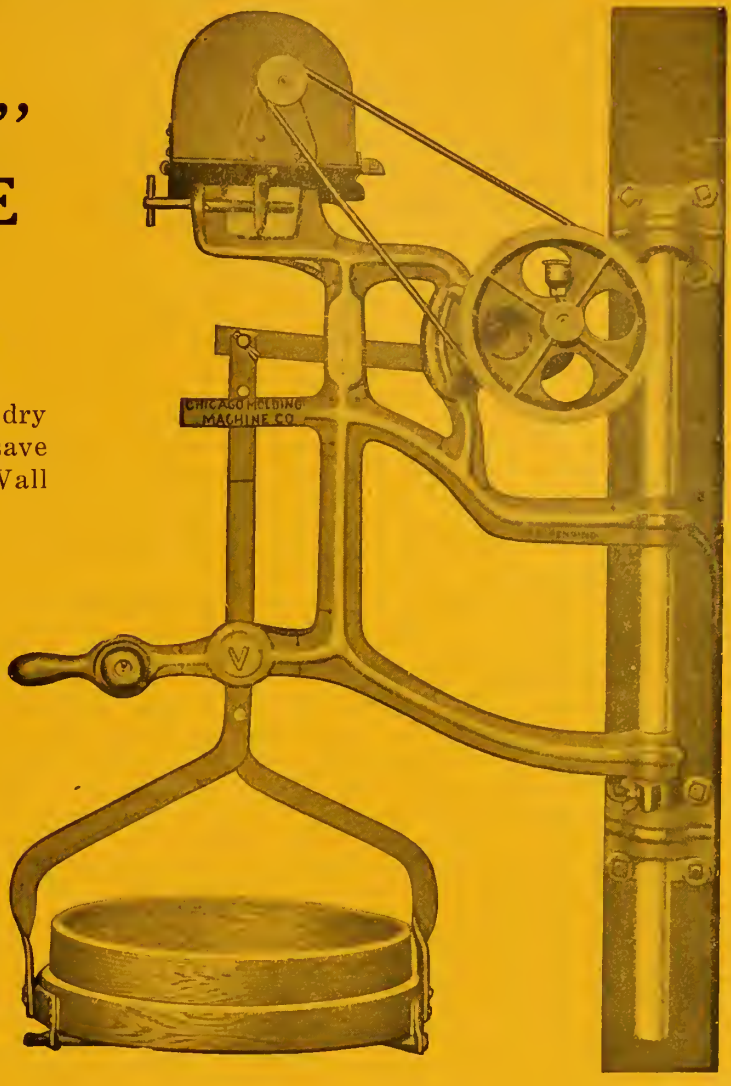
You Can Attach The "VICTOR" WALL RIDDLE To Your Molding Machines

THERE isn't **one** Canadian Foundry—large or small—that won't save money by installing a "Victor" Wall Riddle.

The "Victor" is a different, more convenient, and better type of riddle. It can be attached to post, wall or molding machine and swing over so that it will riddle sand **directly** onto the pattern.

The "Victor" is a fast worker—and because vibration is eliminated will give efficient service for long periods.

You will be pleased to learn that in spite of its valuable features the "Victor" is not an expensive machine. Write us for prices and full particulars.



Saving time by swinging over large floor flasks. Showing operator swinging it over a flask.

The "Victor" is equally valuable in a stationary position. The operator here is riddling core sand.

"VICTOR" Features

Adjustment can be quickly made to different heights.

The frame is in one piece.

The bearings are steel balls in dust proof castings.

The motor is covered with a dust proof box and has four air holes covered with a fine screen directly underneath motor for ventilation.

The Victor is constructed to riddle sand continuously and will stand the wear and tear indefinitely.

The trolley riddle can be swung from a trolley or mounted in a horse and carried anywhere there is sand to riddle.

A great deal of time is saved by swinging the Victor Riddle over large floor flasks and riddling sand over the pattern.

Any stock riddle can be used, and can be quickly removed from the carrier.

CHICAGO MOLDING MACHINE CO., (Not Inc.)

2028 N. Major Ave., Chicago, Ill.

ACTUAL PRODUCTION

The Fastest and the

FOR THIS

1. FORD HOUSING: 22 pairs used in one foundry, making from 350 to 500 complete moulds per day with two men on each pair of Nicholls machines. These men shovel the sand, set cores, put moulds on floor and pour.

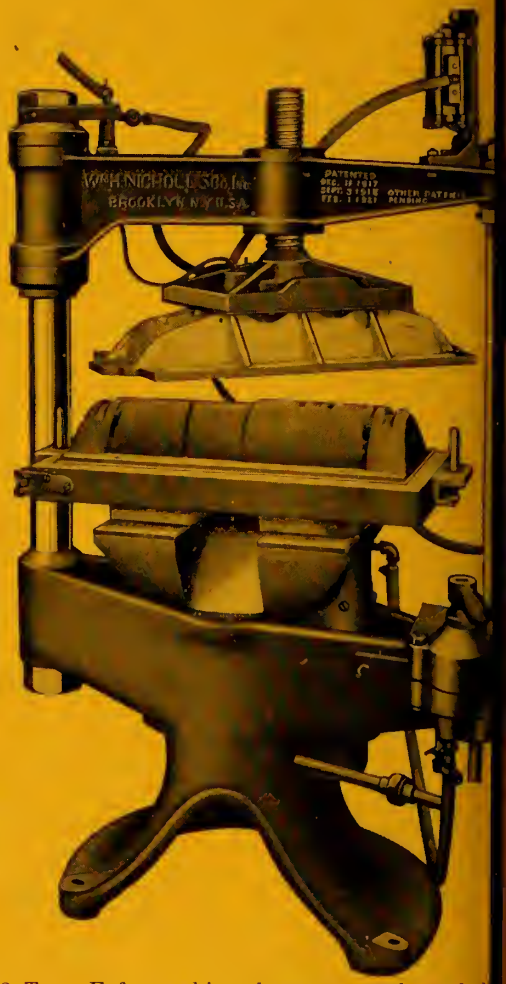
   Previously they made 150 to 200 moulds a day with two men and two machines.

2. CHEVROLET TRANSMISSION HOUSING: Two men with two Nicholls machines made 260 moulds a day. These men shovel sand, set cores, make mould complete, set it on floor and pour.

   Previously they made 36 moulds a day with one man on one machine.

3. FORD BRAKE BAND FLANGE: Two operators with two Nicholls machines made over 500 moulds a day (10 pairs equipped with this job in one shop). The men shoveled the sand, set cores, put moulds on floor and poured.

   Previously they made 125 moulds a day, this was big production for one man on one machine.



10-32 Type E for making drags or nowls and d cult draws. Often wood patterns, fastened on one of a board are used with a 6x4x1-4 steel or cast p fastened on back about 1-64 below the level the plate surface. This works successfully.

In making these and similar castings where large productions are quired (often with the use of unskilled operators) and when the work d by the machine is a more important factor than the man element, th combination jolt and power squeezers with drawing devices have pro most successful.

With this machine, under ordinary foundry conditions, after the opera shovels the sand in the flask it is then jolted a few times by moving the h zontal controlled valve handle to the right with the side of his leg and by time he drops his shovel and the ramhead is pulled forward, it is immedia squeezed by moving the same handle to the left, then this is moved back the neutral or central position and the pattern is drawn on the downstroke the piston by gravity. The vibrator automatically starts and stops. Th four operations completed almost as quickly as it is possible for a man to m this valve handle from one position to another produces a perfectly unif rammed mould with the pattern drawn. This results in an increase of p duction of fifty to one hundred and fifty per cent. and often three hund per cent. or more.

PROVES THE "NICHOLLS"

Best Built Machines

S OF WORK

Type D with open end frame and adjustable side rails for different length and width of pattern plates.

4. DODGE CARRIER: Over 250 moulds a day with two men on two 12-36 type D machines. These men shoveled sand, set cores, put moulds on floor and poured.

   Previously two men made from 80 to 125 moulds a day on two machines.

5. OVERLAND: Two men with two Nicholls machines made 380 moulds a day. These men shoveled sand, set cores, put moulds on floor and poured.

   20 of our machines were equipped with Overland-patterns in this one foundry.

6. BUICK VALVE HOUSINGS: Two men with two Nicholls machines made over 625 moulds a day. These men shoveled the sand, made the moulds complete and set them on the floor.

   Previously two men made 100 to 125 moulds a day with one machine. This was a big production.

We build a 10-32 Combination Jolt and Power Squeezer, Type B, for le face match plates and hard sand matches.

Workmanship on these machines is as good as can be found in the best achine tools. Guides, bushings and working parts of drawing devices are hardened and ground. Pistons also are ground and inspection of these will show that they are within one-thousandth of an inch.

We guarantee whenever necessary to maintain highest efficiency to re- the combination jolt and power squeezers with drawing devices, install sized pistons, replace worn parts and return them in condition same as for ten per cent. a year of original cost.

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Herman Jarr Independent Rollover and Pattern Drawing Machines

If It's a Herman It's Worth Using

It Made Its Way by the Way It's Made

For Medium or Larger Work

IT PAYS to use the best, so long as the price is not exorbitant. By using any other you are losing efficiency.

Foundrymen who have used a Herman Jarr Independent Rollover and Pattern Drawing Molding Machine invariably consider it the worthy choice of any foundry.

Let our Service Department help you determine your molding machine requirements.

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MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U.S.A.

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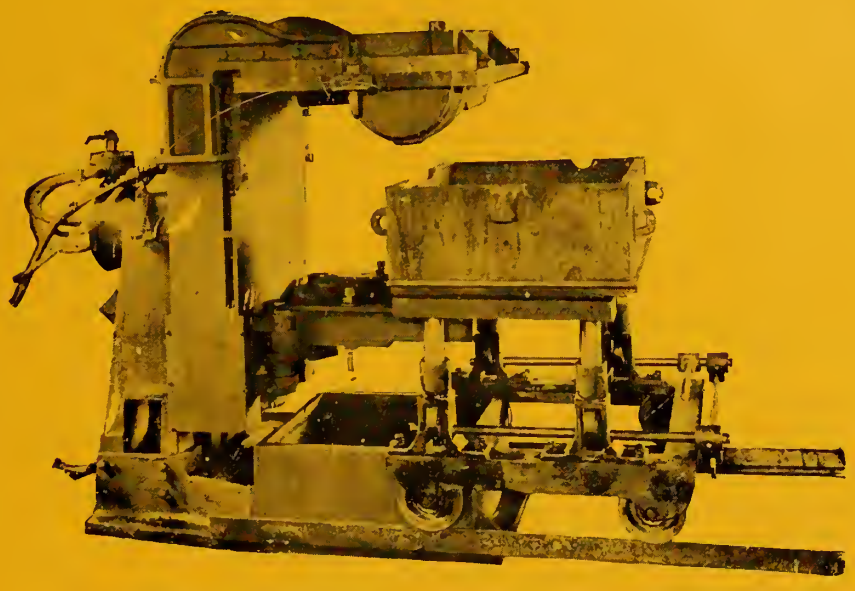
JAR-RAMMED ROLL-OVER MACHINE



Simplicity of design; ease of operation; low cost of installation; no pits to clean; entirely above the floor; little space required—Investigate.

Grimes are made in many different types in both hand and power models up to 5,000 lbs. capacity, for use on a wide variety of work.

Produce Better Castings for Less Money

We would be glad to show you how the Grimes can cut your costs and boost production on your work. Write for catalogue and full details.

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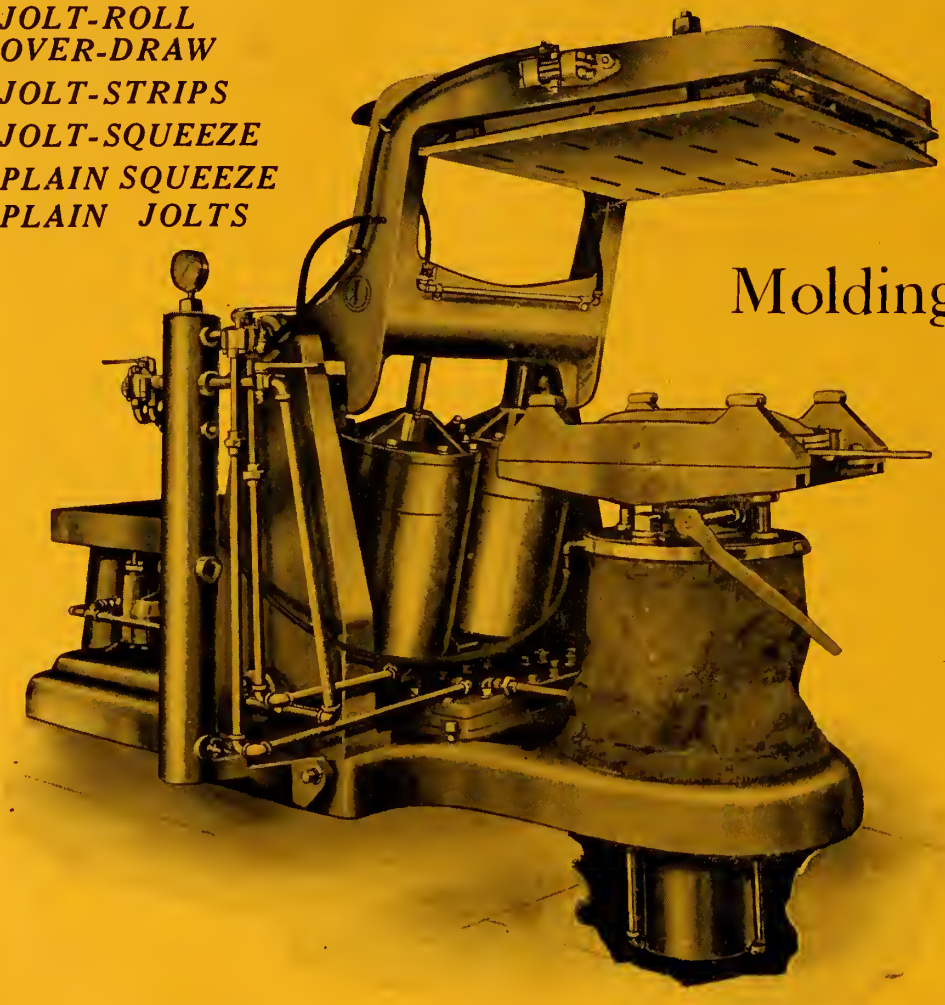
5736 Hastings St. - - DETROIT, Mich.

DAVENPORT

JOLT-ROLL OVER-DRAW
JOLT-STRIPS
JOLT-SQUEEZE
PLAIN SQUEEZE
PLAIN JOLTS



Extra Heavy Jolt

Molding Machines

This Jolt-Rock-Over-Draw Machine is without exception the fastest and most substantial machine made. In one of the large automobile plants it produced 40 drag molds per hour.

The Davenport's popularity is based on its convenient time saving construction. All working parts are above the floor line.

Equipped with fool proof flask rest.

This Machine is built in twelve sizes, ranging in capacities from 500 lbs. to 10,000 lbs. There's the right size to put your Foundry on a better paying basis. The investment will soon pay for itself. Investigate now.

Plain Jolts with Indestructible valve; size of tables 12″ x 18″ to 72″ x 96″. Capacities 300 lbs. to 14,000 lbs.
Plain Air Squeezers.
Combination Jolt Squeezers.
Popular Styles and Sizes.

Now, before you forget, get the facts about this money-saving equipment.

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A 30% to 75% Saving for You!

Buy your Foundry supplies direct from the manufacturer. Eliminate the middleman's profit. Foundrymen get real service in buying from Damp Bros.

We can save you from 30 per cent. to 75 per cent. on all your supplies. Our lines comprise the highest grade equipment obtainable anywhere.

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Ladle Bowls and Shanks.
Steel Bands
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Wooden Snap Flasks.

You'll find longer service in our flat bottom steel ladle bowls. These bowls come in capacities from 50 to 800 lbs.

Don't shove this opportunity aside. Write at once for Prices and liberal Discounts.

All Steel Core Ovens

These core ovens have no cast parts to break. Extra smoke pipe connection takes excess smoke away. All doors have Battle Plate to reduce heat loss when door is open.

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All-Steel Core Ovens.

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We can supply Aluminum Pattern Plates in any size.

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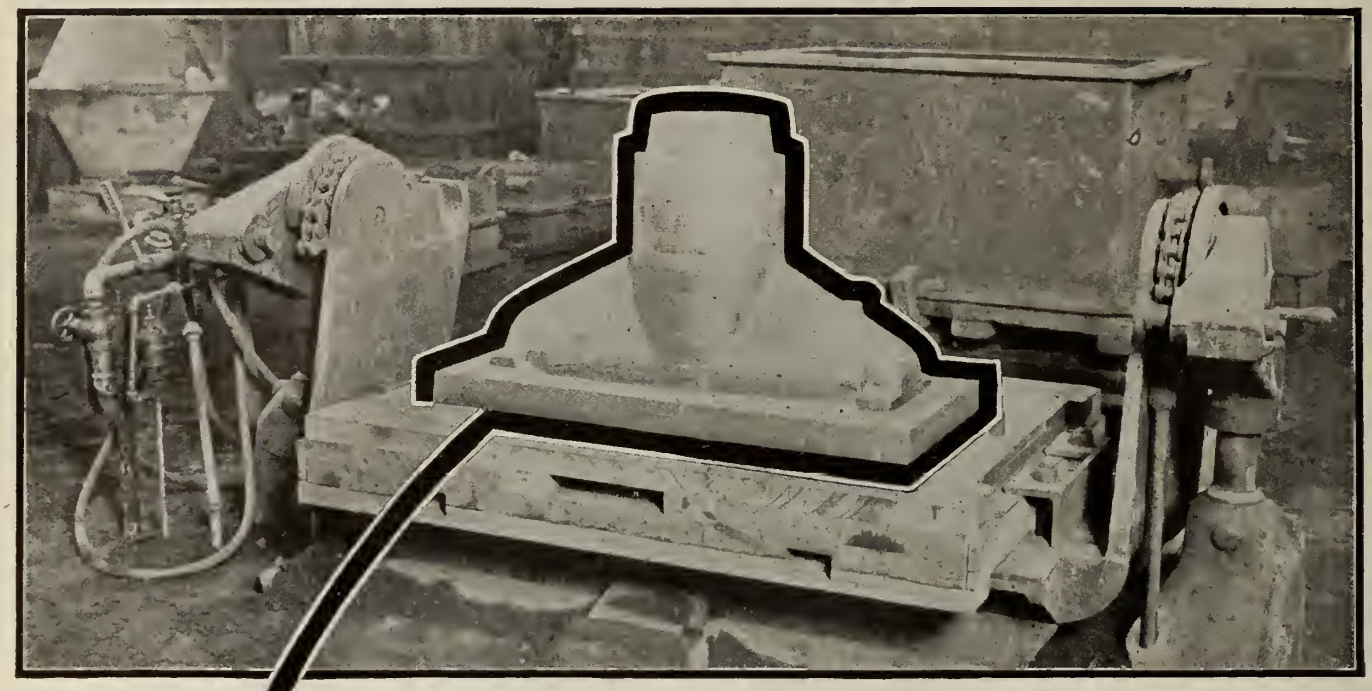

Here's the history of this job in a jobbing foundry before and after machine-moulding:-

Weight, 275 pounds.
Flask (inside).
42″ x 33″ x 24″ high.

Before Mounting—
One man put up
4 moulds in 7 hours

After Mounting—
4 men and one No. 405 machine put up
45 moulds in 7 hours.

Labor Required For moulding, coring, closing and pouring each mou'd
Before—2¼ man-hours.
After—8-10ths man-hrs.

Cost of Mounting Pattern, including labor and materials, $40.00.

Labor Cost reduced 62½%.

Cost of Pattern Mounting saved on the first 28 moulds.

Reducing costs to meet 1921 requirements

ECONOMY in production is the keynote of 1921 manufacturing and selling problems. Extravagant production costs can no longer be passed on to a helpless consumer.

Machine-molding must be utilized wherever possible in order that selling prices will seem reasonable to buyers.

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INCORPORATED
Main Office and Factory
5401 Hamilton Ave. Cleveland, Ohio
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OSBORN

MOULDING MACHINES

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Member of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

Machine Molding in Competition with Hand Work

If the Proper Machine Is Used in the Proper Place It Has Many Advantages Over Hand Work, But Judgment Must Be Used.

By F. H. Bell.

ONCE MORE the subject of machine molding is brought to the attention of foundrymen in this, our annual molding machine number.

Since an annual repetition of the same story would be of little value, we will omit any reference to the history and early use of the molding machine and confine our attention to a short review of what is being done at the present time.

Foundrymen are apt to be wrongfully impressed with the idea that molding machines are only profitably used where repetition work is produced, but on the contrary, their application in the jobbing foundry is almost unlimited, and it is now being generally recognized that no modern foundry management can profitably neglect the employment of molding machines for the production of castings. Such machinery constitutes a valuable asset in any up-to-date foundry, and the queston now is, not whether a founder can afford to install molding machines, but rather whether he can afford to do without them.

The most important conditions which have to be confronted in order to achieve success are capability, durability, simplicity and reliability of the machines adopted. Along with all of this we must incorporate good judgment on the part of the purchaser, to insure that he purchases such machines as are suited to his line of work.

Making The Sand Secure

There are three different methods of compressing the sand into a mold, viz., hand ramming, squeezing and jolting. Each has its advantages. With some types of machine and on certain classes of work it is considered advantageous to do the ramming by hand while having the machine to do most of the other work. It is quite common to shovel in the sand and ram it by hand, and then have a roll-over and pattern drawing device. But apart from hand ramming there are the two outstanding methods, jarring and squeezing.

It must be remembered that sand does not act like a liquid. A liquid, under pressure, is the same at all parts and in every direction. So is gas, but with sand it is different. If sand is squeezed it becomes hard on the surface and softer as it becomes distant from the plunger. If jolted it becomes hard at the bottom and softer as it becomes distant from the bottom. This can be proved by hand experimenting. Fill a box with sand and cover it with a board on which is a heavy weight. After removing the weight and the board the surface of the sand will be hard. Turn the box over and the other side will be soft. Now to test the jolting system, fill a long core box with sand and then jar it against the core bench. On taking the box apart the lower end will be harder than the upper end.

Every molder knows where the advantage is in each of these characteristics. For instance, on light work such as stove plate a soft face is desired so that the metal will lay on it without risk of being cold shot or defective in any way such as a hard face would cause, yet a substantial backing is required to prevent the casting

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from being strained. Now if that class of work is to be done on a machine it is quite reasonable to assume that a squeezer would be in order. Now, supposing we have heavier work and want to use the machine. We want the face hard enough to hold its shape against the effects of the larger quantity of metal being poured over it, yet we want the back to be loose enough to allow the gas to escape. From this it would be reasonable to conclude that the jolter would have advantages. Now, so far, we have only been showing extreme cases, but there are many jobs where we require to have both the face and the back reasonably firm, and there are jobs with pockets where the squeezer does not get at, and where we do not want the pockets too hard. In the case of the latter it would appear that neither machine would be exactly what we want, but by having a combination machine, which both squeezes and jolts, it is quite possible to get anything we want. The jolter can be used until the pockets are sufficiently firm and the squeezer will make the back secure. It must be remembered that either the jolter or the squeezer can be regulated so as to make the mold compact to any degree required.

As we have shown, the jolter will make a hard face, but if we do not want the face hard we just jolt until it is as hard as we want it, and then we squeeze it until the pressure gauge shows us that it is squeezed as hard as we want it and we have a mold just to our desire.

Other Features

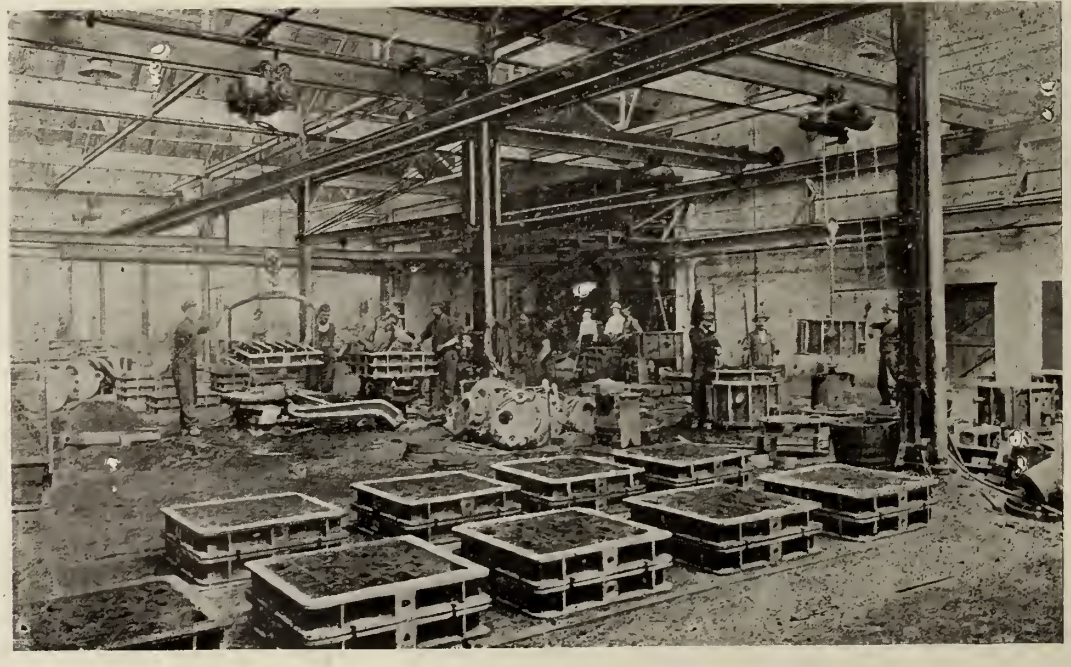
In the operations thus far described we have only dealt with ramming the mold. In addition to this there are other features which are embodied in molding machines, such as rolling over the drag and drawing the pattern. Drawing the patterns is also done in a variety of different methods, according to what style of pattern is to be drawn. For gearing there is nothing better than the stripping plate. In fact, there are a lot of different patterns which can be worked to better advantage on a stripping plate machine than on any other. In molding gearing it is quite common practice to do all the work by hand with the exception of drawing the pattern. The flask is put on the machine and the molding is proceeded with the same as on an ordinary hand-made mold. If it is the drag that is being made it is done in the ordinary way until the time comes for rolling it over, when a lever at the side of the machine is pulled, which operates a toggle under the machine and draws the pattern down through the plate. This leaves a perfect mold which is now rolled over and placed on the floor. For the cope it is quite frequently the case that a sort of match plate on legs is all that is necessary. This, of course, would only be the case where the top of the pattern is plain.

In the various views which will follow the principle of rolling the drag will be shown, it will, therefore, not be necessary to go into detail on that subject.

In concluding my remarks on molding machines, I will point out a few pertinent facts. The jolter and squeezer will do better work than can possibly be done with a hand rammer manipulated by the most skilled molder. I say this advisedly and knowingly, being a molder myself, but perhaps not the most skilled. Every time a rammer strikes the sand it leaves a mark through which the gas penetrates with difficulty. The butt of the rammer is, of course, worse than the pein, but both have a bad effect. Molders think that hard butting is bad, but if butted light no harm results. This is only partially true. The fact that the rammer touches the sand has some bad effects, as it leaves a mark similar to what is expected from a trowel after sleeking. Of course, I am only referring to what is done below the line when the strike stick scrapes it off.

Another test which good molders should try is to sift sand on a complicated pattern and then tuck it with the fingers as is necessary in hand molding and then after completing it, shake it out and all the finger prints will show just as distinctly as though they had been part of the game, yet every one of those prints had a hard surface through which the gas would have a hard struggle to extricate itself.

Supposing we have a piece of a machine of some kind to mold and it has ribs and pockets and the general run of unevennesses all over it, and we proceed to mold it by hand, there is no alternative but to sift on the sand and tuck the sand around the ribs and into the pockets. We sometimes throw a handful of sand into a deep pocket, and if we are used to this kind of work we can do a fair job, but we can not get away from some finger tucking. We then take a needle wire and vent every little nook and corner to prevent scabbing and possible blowing. We next shovel in a little bit of heap sand and then take the hammer handle or some sort of small rammer and lightly ram the sand into such places as we cannot hope to get with the big rammer. After this we put in some more sand, and if it is a deep mold we have to put in layers of sand after each ramming. We put in a few inches of sand and then go over it with the pein of the rammer, being careful to not strike the pattern. Then we get inside and tramp it down with our feet, and if the occasion warrants it we take



Making mold for job 30 inches high and 10 ft. in. long on a Herman jolter. mo.d, and the p.ain jarring machine for the other.

the butt of the rammer and give it a few swipes. This is continued until the flask is rammed full. While we are doing this we are following up the layers with the vent wire and after the ramming is done and the mold is struck off we give it a sort of "review of reviews" with a long vent wire which is supposed to connect up all the others.

Now if we put this same job on a jolter we sift on the sand until the pattern is covered and shovel in heap sand until it is stacked up above the top of the flask. We then turn on the power, whether it be air, electricity or belt, and after giving it a few bumps the mold is complete as far as ramming is concerned.

This might sound exaggerated, but I have in mind a molder who served a long apprenticeship in England and who had traveled extensively and held down some good positions as foreman, and he showed me a hand-operated jolter which he was using on grate bars, and which he pronounced as the best idea he had ever come across. He was using sand off the regular sand heap, sifting it on to the pattern and giving it a few jolts by hand. No venting. Pull a lever to draw the pattern or rather to let the flask fall away from the pattern and it was ready to put on the floor. This was one of the simplest kind of jolt, rollover pattern drawing machines and could be used to advantage in the smallest of jobbing foundries. Of course, hand-operated machines are not the rage these days, but they carry the essential features of the power driven machine.

As I have already shown there are lines of work where a jolter is not required, and where a squeezer is ideal. Then again, there are places where all the devices can be called into useful action on the same job. This calls for a combination machine. There are also jobs where the drag will be made on one type of machine and the cope on an entirely different type. Then there are other jobs where the one machine makes the top and bottom of the mold, some even doing both halves from the same pattern, as in the case of a pulley molding machine, where the cope is simply a drag turned upside down.

Other Devices

There are other ways of putting the sand around the pattern besides those mentioned, but which are to all intents and purposes the same. For instance, a sand throwing machine or a gravity machine acts the same as a jolter. The sand in falling or in being thrown is compressed into the mold the same as though on a jolter, by its own momentum. For further light on the subject of molding machines we will refer to those who are in a position to speak authoritatively.

In urging foundry men to adopt the molding machine I do not overlook the fact that there will always be jobbing floors and jobbing molders and incidentally stock work, which it might not be considered advisable to put on the machine, but at the same time I am confident that the foundry man who is going to remain in business will have to turn his attention to the molding machine.

Apart from what is distinctly known as the molding machine there are other machines which perform valuable operations in the making of the mold, either by hand or on a machine. Take, for instance, the vibrator. This little instrument is invaluable in machine molding and also serves a valuable purpose in hand work, taking the place of an extra man with a mallet. Then there is the pneumatic rammer. Where the ramming has to be done by hand, as we have shown or where large work beyond the capacity of the machine is to be rammed, there is no occasion for the molder to exert his muscular ability on a hand-operated rammer. The pneumatic rammer is held in the hand the same as any other rammer, and the compressed air does the work. One of these rammers will do the work of several men and it will be much easier for the man than doing all the work himself. There are numerous other small devices, all of which are, in a way, molding machines, but which are not classed under that heading, but which are valuable assets to the foundry man.

Now, getting back to the molding machine proper, and molding as a trade, I will refer to a lecture delivered by Mr. Wilfred Lewis, M.E. President of the Tabor Manufacturing Company, at the Franklin Institute some time ago.

Molding by Hand and on the Molding Machine

A Short Review of Molding As An Occupation, Introducing the Early Machine and Finally the Modern Molding Machine.

By Wilfred Lewis, M. E.

THE ART of molding is probably as old as civilization, and it may have reached a high state of development before any of the events which make up ancient history took place. In fact, the molder's skill, as exemplified in many antique works of art, has been one of the great civilizing forces of the world, and it may be questioned whether we can produce today any finer examples of this art than are found among the relics of antiquity. But as civilization has progressed the demand for the products of the foundry has increased to such an extent as to call for new processes, better methods and greater efficiency. The printing press, the steam engine, the loom, and more recently the internal combustion engine, have stimulated the activities of men, augmented their productive capacities and so enlarged the possibilities for commercial intercourse that it is difficult to realize how few of the comforts of life now enjoyed by the masses were within reach of the well-to-do or even the wealthy members of society, as it was constituted two hundred or even one hundred years ago. George Washington, for example, began his career as a surveyor; carried with him the bare necessities of life, often slept out of doors on a bed of hay or straw, swam the streams that were too deep to ford, and later on, after enduring innumerable hardships and privations in many

A Tabor machine on small work.

hard-fought campaigns, laid the foundation for the government which stands as a monument to his sagacity, courage and determination. There were no Pullman cars for him and no potentate, however great or wealthy, could have travelled a hundred years ago with the luxurious ease now within the reach of those with very moderate means.

Going back a little further to Columbus, in the height of his glory as the first admiral of what was then the greatest power in the world, we can imagine his quarters on a flagship, which was but little if any better in size and comfort than the lifeboat of a modern steamer. In short, since man first began to utilize the forces of nature, so abundantly provided for his material comfort and enjoyment, the productive capacity of the world has increased at a rate which staggers the mind to follow and reduces to nothingness the spells wrought by Aladdin and his wonderful lamp

To compare the industrial progress made since the discovery of America with all that went before would be a hopeless task, but it is not hard to believe that the nineteenth century alone surpassed in the development of the arts and sciences all that was inherited from the past and that in all probability the twentieth century will do the same. The present rate of industrial progress is indeed so rapid as to almost defy pursuit, and it is only possible to keep in touch with it in spots where our own special interests are involved.

No man nor set of men can grasp the enormous accumulation of knowledge bound up with advancing civilization, and as fast as the work of yesterday can be recorded the achievements of today are almost out of sight. This cannot go on forever at undiminished speed and it is clearly due to the awakening of man to a knowledge of the natural forces within his grasp. It is accompanied at the same time by the destruction of the resources upon which it feeds and grows, and it will sooner or later be followed by a reaction when posterity begins to descend the slope leading back to the ashes from which so much greatness and power has been derived. A great deal of permanent value will, no doubt, remain, but with the prospect of exhausted resources before us, however distant that time may be, we may well pause for a moment to consider not only the conservation of natural resources, but also the efficiency of human labor upon which the conversion of our resources into wealth depends. We cannot eat our cake and have it, but we can make it last a long time and enjoy it with more satisfaction if we do not bolt it all at once.

But the conquest of nature is not to be halted by sentimental considerations and the consumption of our resources will no doubt go on unabated until their conservation becomes a crying need. Its consideration now as a matter of national importance is one of the most hopeful signs of the times, and fortunately for all of us, efficiency as well as economy in all the affairs of life is coming into the foreground and receiving more attention than it ever has before.

People are beginning to realize that the high cost of living is due chiefly to extravagance and waste, and that there is such a thing as scientific management by which human labor may be conserved and its products enormously increased. When rightly understood and applied this benefits the wage-earner, the employer and the public as well, and goes a long way towards the solution of the labor problem, which is inseparable from the cost of living.

Jobs done on a jar, roll-over stripping plate machine.

Improvements in machinery, combined with power for its operation, have worked wonders in the output of labor, but only a fraction of what can be realized from the same amount of human effort when more intelligently directed and controlled. The all-round mechanics of former years have well-nigh disappeared and good workmen, if obtained at all, must be recruited from such raw material as can be found unemployed. There is always an abundance of the inefficient kind, and the problem now confronting the manufacturer is how to make it efficient and valuable. The answer to this is to be found in the introduction of an educational system of management not unlike the laboratory system adopted in some of our schools and colleges. Men must not be left to their own devices to pick up such knowledge as may make them inferior or merely good enough workmen. They must be systematically taught to perform the work assigned to them by shop bosses or foremen who are interested in the result, and whose chief function it is to teach.

In this way every shop in the country may become in effect a trade school of the most valuable kind, in which the pupils are not only taught how to do certain things, but how to do them quickly and well and earn a substantial reward commensurate with the skill attained. No labor-saving machine can produce results without human aid in one way or another and many a machine, good for its purpose, has been abandoned to the scrap heap, not from any inherent defect or inability to effect a saving, but simply as the result of awkward or inefficient handling. We must have efficient workmen as well as efficient machines to obtain the best results, and foundries need both as much as, or possibly more than any other kind of operating plant today.

Although modern industry depends upon the foundry for a large part of its products and the ingenuity of inventors has been busily engaged for generations in the evolution of labor-saving machinery, very little of this effort has been devoted to the improvement of the foundry itself, and it is only within comparatively recent years that machine molding has developed much importance as an art. In the year 1800 an English patent was granted for molding screws, the patterns for which were backed out of the sand by lead screws of the same pitch. This was simply a pattern drawing machine of rather ingenious construction, but the English records do not touch again upon machine molding until 1839, when a very similar patent appears.

From this time forward more interest seems to have been aroused and these patents were soon followed by others for packing the sand by mechanical means, including hydraulic cylin-

ders, stampers and rollers of the road-roller type. Machines for molding gears and pipes also appear in the first half of the nineteenth century, and in 1843 we find an American patent on the molding of cannon balls. Later, in 1869, the first jarring machine patent was taken out, but it is not proposed to give a history of the art of machine molding from patent office records, and it may simply be noted that the art began in a small way on bench work and continued chiefly in its application to small molds that one or two men could handle until the end of the last century. Larger work was not generally regarded as applicable to machine molding until the jarring machine began to emerge from a long period of obscurity and demonstrate its peculiar fitness for ramming large bodies of sand.

Its development for large work belongs mainly to the present century and through its means the art of machine molding has been extended to embrace nearly everything molded in sand. But there are, of course, exceptions and peculiar difficulties, which will always depend upon the molder's skill for their proper execution, with or without the aid of machines, and like any other equipment the installation of molding machines must depend upon the saving to be effected by their use and the outlay needed to effect that saving. This leads at once to the consideration of foundry costs, the analysis of which should point the way to their reduction. These costs are made up of many important elements beyond the scope of the subject, and the effect of one item only need be considered, that of machine molding, leaving all other items to be treated in the same way by those who are interested in attaining the highest efficiency in every detail of operation. Machine molding began, as has been said, on small work and probably one of the best known appliances is the little hand squeezer. This is a very simple and effective machine designed to save part of the time consumed in ramming.

Osborne Co. Historical Molding Machine Dept.

Described as a Device Employing the Same Methods as Are Employed in Smashing Scrap Iron, But With the Delicate Precision of a Machine Tool.

By Donald Payne.

IN ANY race or rivalry the contestant who "comes up from behind" always appeals to the red-blooded American public.

Machine-molding is just such a contestant.

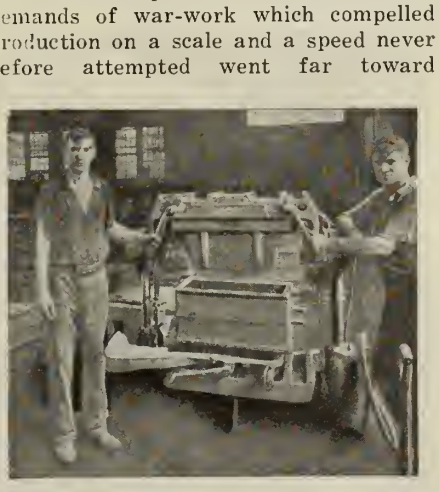
Fifteen years ago the theory was new—the actual practice of it negligible. Arrayed against it were the deeply ingrained habit and custom of centuries, dating back to the day when the first artisan poured molten metal into a crude mold.

The pioneers in the theory of substituting machine-power for human muscle faced other obstacles besides established custom. Reliable detailed data and accurate cost-figures were scarce. Limited initial resources handicapped the progress of proper research and investigation.

Notable among the early pioneers who fought against these conditions was Mr. Wilfred Lewis, engineer for the Taber Manufacturing Company, to whom high credit is due for unflagging persistence.

New practices rarely supplant established custom except by gradual change. In 1908 when the Osborn Manufacturing Company awoke to foundry needs because of its sales of supplies and equipment and enlisted in the fight, machine-molding had in reality only gained a slight foothold.

Even in 1913, the last year before the war, with several manufacturers in the field, it is doubtful whether the total of all sales for the year passed the half-million dollar point. The unprecedented demands of war-work which compelled production on a scale and a speed never before attempted went far toward



An Osborne Machine

spreading the gospel of machine-molding and introducing it into foundries which had never before given it proper consideration.

From that point on changes into the machine-molding column came steadily and rapidly until for the current year Osborn sales alone will touch the $2,500,000 mark.

Obviously machine-molding has undergone steady improvement in the past ten years. The original machines, for instance, were of bolted construction in contrast to the unit-casting frame-construction employed today.

Osborn engineers from the first were fortunately so placed that they were in an especially advantageous position to perfect these details. The plant behind them was equipped as needs developed with the right machines for each step, without compelling them to adapt their designs to meet the manufacturing limitations of existing equipment. As one of them well expressed it: "We are not forced to design something our machines will build—we design what we know is right and then hunt out the right machinery to make it."

The goal of these designs was to produce a machine which, reducing hand-work to the minimum, would solely by mechanical means (1) ram the mold sand vigorously but uniformly around and beneath the pattern; (2) turn the mold into position to permit withdrawing the pattern; (3) remove the pattern without disturbing the sand in the slightest degree and thus distorting the mold. (Note—Slicking and patching a mold by hand is inaccurate and creates hard, non-porous spots which later prevent the even escape of gases and cause "bulges" in the casting.

How important a part this freedom of design was to play in solving the problem can be well illustrated by explaining one or two conditions which confront a designer of molding machines.

First among these difficulties was the fact that the very action on which the jolt machine depends for its efficiency is exactly parallel to the methods employed to break up castings to be scrapped. To build a machine to utilize this same force was a task never before faced by designers of mechanical equipment.

Added to the obstacle raised by the abusive nature of the operation itself came the problem of making a machine so delicate in operation that, after ramming, the pattern could be withdrawn from the sand without disturbing the sand beyond the close limits of present-day clearance requirements and without allowing any quiver or shake to break the fragile ribs and partitions of sand.

In spite of these two diametrically opposed requirements, the requisite machine-tool provision has been built into molding machines so ruggedly and maintained so successfully that machine-molding is now an undeniable world-wide success.

WHAT OUTSIDERS THINK OF CANADA AS A MARKET FOR MOLDING MACHINES

A short time ago we had a call from Mr. Morgan of the Herman Pneumatic Machine Co. He did not indulge in idle gossip but he told us candidly that he was surprised at Canada as a manufacturing nation. He had pictured Can-

ada as an agricultural country but he had his eyes opened when he saw bath tubs and such lines as this made on automatic machines. He remarked that he had not seen such well equipped plants in the States as he saw here. Mr. R. F. Pringle, works manager for the same company at the plant at Zelienople, Pa., also says of us, "We agree that the molding machine is the main thought of the Canadian foundrymen, as the enquiries we receive from them, and the machines we have sold, show that they are a very progressive set of foundrymen there."

Mr. H. W. Brown of the Tabor Manufacturing Co., of Philadelphia, in speaking of Canada and incidentally of Canadian Foundryman which has been published since 1909 said some time ago that their opinion of our country as a market and our paper as a medium through which to reach the market could be judged from the fact that they were the first company to patronize our paper and that they had not missed an issue since.

Where Power Is Not Available

Describing a Modern Hand-Operated, All-Round Molding Machine Which May Be Built to Run by Electricity.

WHILE the aim is to introduce automatic power driven machines wherever possible, there are numerous instances where it is not practicable and others where it is not possible. There are innumerable small institutions where the proprietor is energetic but financially unable to install the machinery required for operating such molding machines as could be used to advantage in some of the more pretentious plants. Then there are some of the larger foundries where the owner does not consider the line of work being done as being beyond the limits of man power. In fact, there are lots of places where hand-operated machines are called for, and when a man calls for a hand-operated machine, that is what he wants and will have. The old-time man-killing hand machine is not necessary any longer, as there are thoroughly modern hand machines being made.

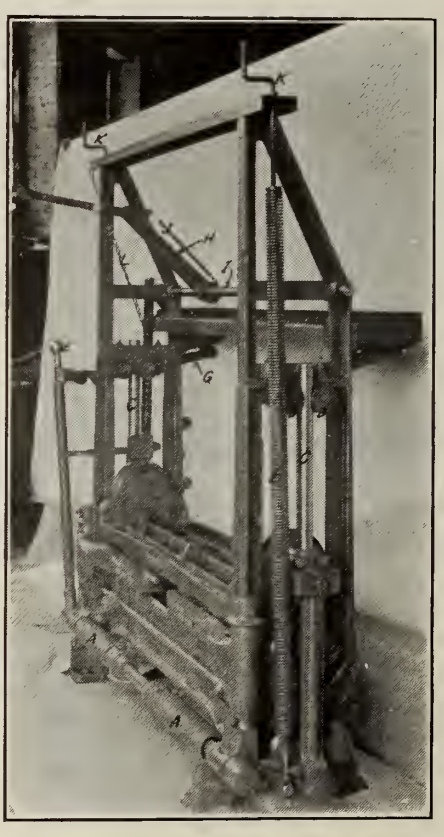
The American Foundry Equipment Company of New York are particularly pushing their hand-operated line, which includes jolting, roll-over, squeezing and pattern drawing. In the illustrations will be seen the machine which they reckon as their latest and best and which is designated as No. 61. Following is what they say about their machine:

"By successfully combining the four steps: jolt - ramming, rolling over, squeezing and pattern drawing, into one simple machine, it overcame the pressing need for skilled molders in certain foundries at a time when skilled men could not be had, and thereby demonstrated that an unskilled man can make perfect molds at a profitable production rate, provided he is given the right machine and equipment.

"The jolting motion is imparted by a forward pull of the spring-balanced handle which is shown beneath the top member of the machine frame. This motion is more natural, easy and decidedly less fatiguing then an up-and-down arm or pedal stroke. It calls into use the shoulder and biceps muscles rather than leg, hip and back muscles as formerly.

"By the introduction of a long upright tension spring at each side of the machine, each spring adjustable by a threaded crank at the top, the cradle and flask load are held in suspension three or four inches above the jolting pads. A sensitive arrangement of pivoted arms connects the jolting handle with the cradle-lifting arms by way of the pattern drawing lever, thereby imparting the jolting motion.

"A forward pull of the handle brings the cradle down sharply upon the pads, causing it to rebound for the next stroke. By successive pulls of the handle as many jolts as desired are given. As much or as little impetus as the operator wishes may be put into the jolting. The fact that the loaded cradle is in a state of equilibrium, by reason of the springs, makes the jolting operation remarkably elastic and not at all fatiguing. The cradle has a motion of four and a half to five inches vertical travel in jolting."



Hand operated jolt, squeeze, roll over and pattern drawing machine. American Fdy. Equipment Company.

Following is an outline of the succession of operations in making a mold on this machine:

1. Attach mounted patterns to cradle, both cope and drag.
2. Place flasks, permanent or snap, upon the pattern mounts.
3. Fill flasks with sand.
4. Adjust the horizontal and upright springs, as per instructions, until the loaded cradle is suspended 3½ or 4 inches above the jolting pads. (This is done only when changing patterns).
5. Jolt as described, using the upper jolting handle. In most cases no hand ramming or tucking is necessary.
6. Strike off. Place bottom and cope plates, and apply clamp.
7. Raise cradle to allow it to roll over.
8. Apply compression by depressing the long squeeze lever; this also automatically releases the clamp.
9. Draw the pattern by smoothly raising the cradle with the round knobbed lever, at the same time rapping or vibrating the cradle.
10. Release swinging tables and bring the work forward; set cores; place cope on drag; set down the mold for pouring.

Specifications

Largest cope and drag (both together) at one operation, 16x24 inches.

Largest cope or drag (one at a time) at one operation, 24x40 inches.

Pattern draw, 6 inches.

Cradle lift, 11 inches.

Cradle lift, reversed, 21½ inches.

Width over all, 72 inches.

Height of pattern rests from floor, 21½ inches.

Height over all, 83 inches.

Depth with tables extended, 48 inches.

Weight, net, 1,700 pounds.

Weight, boxed for export, 2,250 pounds.

Dimensions, boxed, 14 inches long, 32 inches wide, 60 inches deep (1 box).

This machine is also constructed to be driven by electric motor.

A HANDY BOOK FOR FOUNDRYMEN

The Farrell-Cheek Steel Foundry Company, Sandusky, Ohio, has just issued one of the most complete handbooks on foundry practice ever issued. It not only describes, but illustrates profusely, each operation required in making of a casting—the same casting or pattern being used throughout.

For years the foundry industry has needed a book of this kind in order to make the average buyer of castings realize the many operations through which a casting passes, and the Farrell-Cheek Steel Foundry Company have very aptly shown this. It is printed in four colors and profusely illustrated.

Strong Points in Favor of Molding Machines

Various Reasons Why Machines Should Be Installed, Together With Some Features of the Herman Pneumatic Machines.

NO FOUNDRYMAN may enter the ranks of competition with his fellow-foundryman to-day who does not employ jarring machinery for molding purposes.

There are many reasons for this:

First—By means of the jarring machine you secure a perfectly rammed and evenly molded product.

(a) Perfect because exact.

(b) Evenly molded because it is possible by the jarring machine method only to obtain uniform distribution of the sand, mold true to pattern, and a casting free from local swells and fins.

(c) Machine molded castings are uniform in weight—only a variation of a few pounds occurring in long runs.

(d) Machine molded castings are also much lighter in weight than the hand-molded article—an obvious advantage.

Second—A more economic product from two standpoints.

(a) It reduces the necessity for skilled labor to a minimum, sand being shoveled by laborers—not molders, and dispenses with hard hand ramming altogether.

(b) One jarring machine has the capacity of several men, the production being four to one as a general average in favor of jarring-machine molding over hand ramming, and in many cases more.

These are assets which you cannot afford to ignore.

An entirely new principle is involved in the Herman Pneumatic jarring machine, the explanation of which follows.

Design

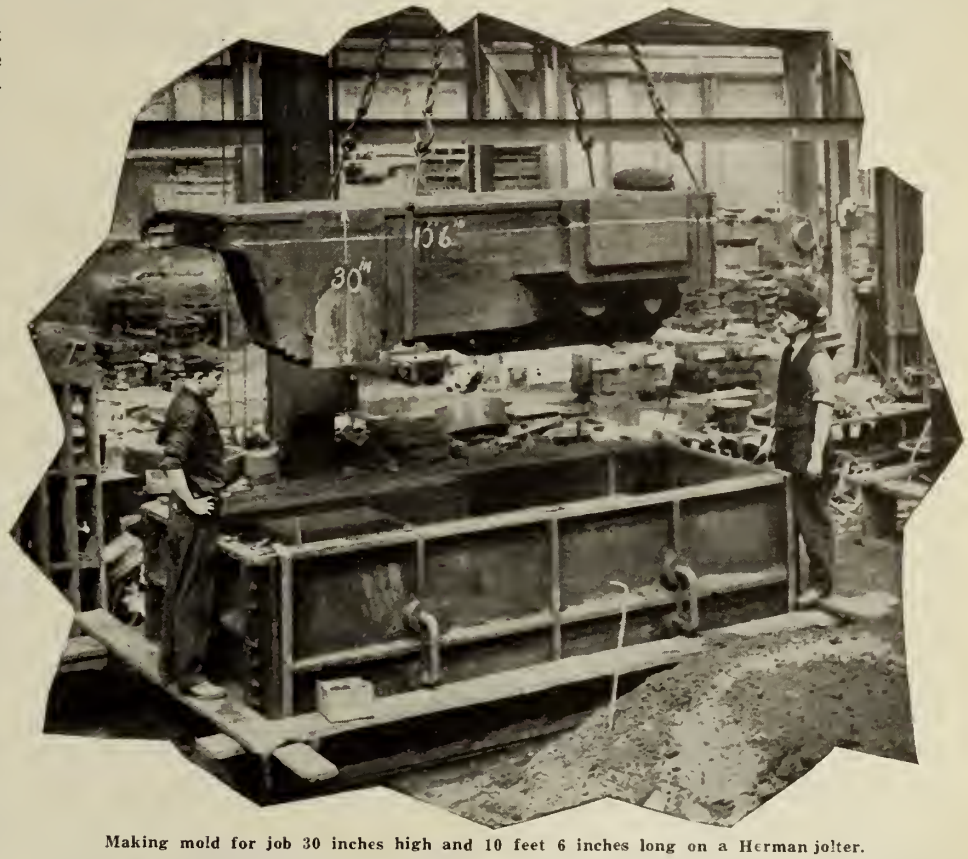
The general design illustrated in Fig. 1 and 2 is employed in all these machines. Fig. 1 is the table and Fig. 2 is the base. Each pocket contains a rubber disc which is covered with a steel disc and a pin through both holding them in position. This forms the resilient surface, the one essential feature which constitutes a jarring machine. The side guides thus relieve the cylinder of stress and strain, the distribution of the jarring discs making it possible to ram a mold on the corners with a Herman machine as well as ramming in the centre.

The Valve

The valve is simplicity itself. It consists of a simple valve body and piston, so designed as to admit only a sufficient amount of air to lift the load required. Should too much air be admitted into the cylinder the machine will not give the proper jar required to ram the mold.

Shock Absorbers

The anvil proper has a number of shock absorbers, which prevent rebound and enable copes to be made as well as drags. To do this successfully a machine must be built in this way. The resilient surfaces in the base (referred to above



Making mold for job 30 inches high and 10 feet 6 inches long on a Herman jolter.

Fig. 1.—Table for plain jarring machine. Herman Pneumatic Machine Co.

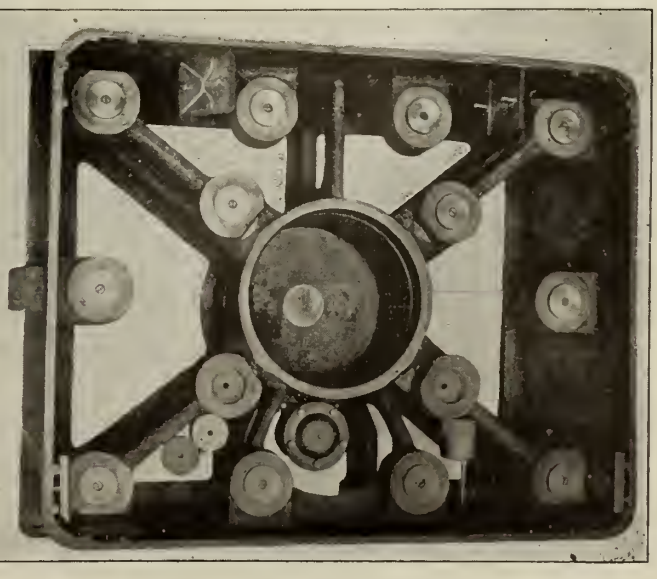


Fig. 2.—Base for same showing pockets containing rubber and steel discs.

as shock absorbers,) eliminate danger of molds dropping, due to vibration of the table plate.

Jarring Extra Large Molds

When molds of larger dimensions than those of the table of the jolter are to be made it is quite feasible to place I beams on the table as shown in the illustration and place the mold on top of these. Lathe beds, engine beds and similar jobs have been successfully done this way. By this means it is possible to mold almost anything on the jolter providing of course that the I beams are rigid enough to not spring down on the ends from the jar in which case they would tend to damage the mold.

The same principles involved in these "heavy work" jolters are utilized in the machines for the smaller type of machine.

Air Squeezing, Pattern-Drawing Machine

How Compressed Air Re-inforced With Oil Makes a Perfect Drawing Medium.

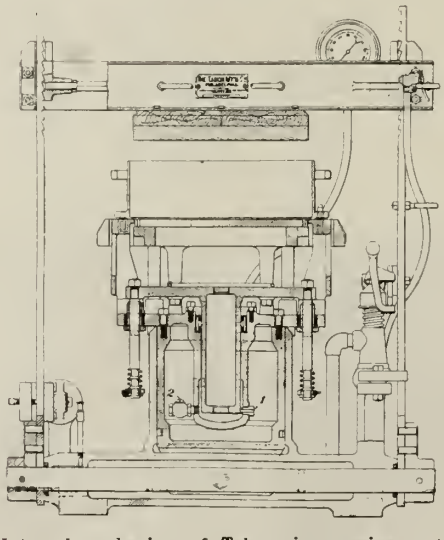
ANYONE who has ever had experience with operating a pneumatic hoist or any other device which is operated by compressed air, will readily realize how adaptable it will be for delicate work like drawing patterns on the machine, or for any other operation where shock is undesirable. Any type of mechanical device which is accurately constructed can be made to do the work, but for freedom of action and easy control there are few devices which can surpass the compressed air apparatus. If compressed air is admitted into an upright cylinder fitted with a piston the piston will move upwards, similar to what it would do if steam had been admitted and if it is allowed to slowly escape the piston will settle back into its former position. The one drawback to air is that it moves so easily that it can be made to do better service by having a quantity of oil between it and the piston. Oil, like all liquid, has no yielding or cushioning qualifications and anything striking a body of oil might as well strike a metallic bed, but by having it backed up by air it makes a perfect cushion.

In the illustration will be seen how this is accomplished. Attached to the bottom frame of the machine will be seen the main cylinder, inside of which is the main piston which carries inside of it a smaller cylinder which in turn is fitted with a piston. The main or outer cylinder is the squeezing cylinder and the inner one is for drawing the pattern. The space inside of the main piston and surrounding the inner cylinder is used as a reservoir for the oil. The pattern drawing piston is not connected to the table on which the patterns are placed, for the reason that the patterns are drawn by lifting the mold from them. The patterns rest upon the table supported by the main cylinder and the flask rests upon the frame supported by the pattern drawing piston.

In operating the machine the flask is placed in position over the pins in the flask frame of the machine. After putting in the sand the yoke which is shown supported by the two side irons, and which can be swung backward and forward is drawn forward and the compressed air admitted by pressing the operating lever, thus opening the pop throttle valve and allowing the compressed air to enter the squeezing cylinder.

When the pressure gauge indicates that the sand is sufficiently compact, the operator releases the valve lever and allows the piston with the members carried by it to resume their normal position.

After the yoke is thrown back the drawing of the pattern is accomplished by raising the operating lever of the machine, thereby admitting compressed air into the space occupied by the oil, thus forcing the oil through the opening marked (1) in the pattern drawing cylinder, which causes the pattern-drawing piston to rise carrying with it the flask frame and flask, thus lifting the mold from the pattern. This same movement of the lever admits the air into the vibrator which vibrates the pattern as the mold is being raised from it. By carefully examining the nipple



Internal mechanism of Tabor air-squeezing, pattern-drawing molding machine.

(1) where the oil enters the pattern-drawing cylinder and which is rather small in the illustration, it will be seen that it is screwed in beyond the wall until it almost touches the inner piston. This is done intentionally so that the oil will enter very slowly and starting the piston equally as slowly. The idea is to start drawing the pattern slow the same as a molder would do by hand. As the piston begins to pass t nipple the oil will enter more rapi until it is entirely passed when the p ton will finish the stroke at high spe This insures a slow draw until the m is free from the patterns, while n wasting any time afterward.

The operating lever will now be leased, thus opening the valves and lowing the oil to escape from the cyl der and causing the piston and fla frame to settle back into their norm position, while the molder is removi mold to the floor. The check valve (allows the oil to escape rapidly where if the opening (1) was the only out a delay would be caused unnecessar when the piston would be passing t nipple.

Catalogues

"American" Sand Blast Equipment the title of a catalogue being distribut by the American Foundry Equipm Company, 52 Vanderbilt avenue, N York City. The equipment present comprises two successful lines here fore manufactured by this company a the Rich Foundry Equipment Compa and includes rotary table rooms, au matic tables, revolving barrels, bl cabinets, pressure tanks, dust arrest and accessory equipment. Through c solidation they are now enabled to of from one source an exceptionally bro line of standardized equipment, adap to use in foundries, forge shops a metal working plants. They also cla exceptional facilities for developi special sand blast apparatus to m unusual requirements. The name "H mane" has been attached to their sa blast room with a view to showing t advance which has been made towa healthfulness and is already being flected in the more favorable attitu among workmen and employers.

A MONSTER BRITISH CASTING

One of the largest, if not quite t largest steel ingot mould ever made w recently cast in Great Britain. It over 15 feet long and its diameter is o 9 feet. This mould which will be u for the casting of steel was so huge t it was almost too large to be conveyed the railway and great ingenuity was ercised in arranging it for transport. was carried on a huge steel girder wh rested on two 8-wheeled trucks, betwe which the mould hung. The weight this record casting was 87½ tons.

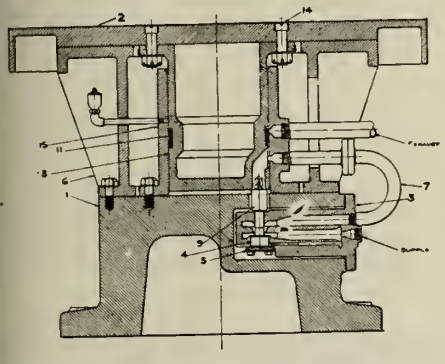
MOVED INTO NEW QUARTERS

The Magnetic Manufacturing Co., w up to the present time have been loca at 764 Windlake Avenue, Milwauk Wis., have found the premises ina quate for their growing business a have built larger and more suitab buildings at 23rd Avenue, north of Sou Pierce St., in that city and are now mo ing their machinery into the new buil ings.

Internal Mechanism Of The Jarring Machine.

How the Mumford Jolter Operates Without Causing Commotion in Other Parts of the Shop.

FOR quantity production from a given pattern or plate of patterns, Hanna Engineering Works, Chicago, U.S.A., manufacturer and distributor for the Mumford Molding Machine Company, has developed the Split Pattern Vibrator Machine shown in the accompanying illustration. It is especially designed for patterns split to a flat or nearly flat joint and fastened to a flat single-faced pattern plate. May be used with stripping plate patterns by raising the pat-



Internal mechanism of Mumford jarring machine.

terns from the face of the pattern plate a distance equal to the thickness of the stripping plate, the stripping plate lying loosely on the pattern plate and projecting sufficiently to engage the flask frame and the extra long pins fitted to the flask pin lugs. The flask pins are withdrawn from the flask when patterns are drawn from the sand.

Mumford Split Pattern Machines can be furnished with or without stooling devices.

This type of machine is fitted with automatic slow start oil pattern draft cylinders controlled by a knee valve, giving a smooth slow start for the first three-quarters of an inch with a rapid finish for the balance of the pattern draw, thereby leaving the operator's hands free to pick up the mold the instant the pattern is drawn. While the mold is being carried to the floor, the flask frame settles to its original position and the machine is then ready for the next flask.

A description of the machine is as follows: (1) is the base, (2) is the table, (3) the inside body, (4) valve piston, (5) valve body cap, (6) bumper frame, (7) connection pipe, (8) is the piston or plunger, (9) operating stud, (11) piston ring, (14) table bolt, and (15) is the cylinder. In operating the jolter the flask and pattern are placed on the table and the table jolted up and down, and the sand, from its own weight and momentum settles down into every detail of the pattern, making a mold of superior quality, and jolted to any degree of density. The jolting operation is performed by letting the compressed air into the supply pipe where it passes into the valve, through the connection pipe (7) and into the cylinder (15). As the air expands it raises the plunger (8) and in so doing reverses the valve, thus cutting off the pressure. The plunger will now be high enough to allow the air to escape through the exhaust pipe, allowing the plunger to descend and the table (2) to jar against the bumper frame (6). This operation is repeated until the desired degree of density is accomplished.

It must not be taken from this that the dead weight of the table falls upon the solid iron bumper, as this would cause a commotion in the foundry and do damage to molds in all parts of the shop and in all probability destroy the mold which is being jolted. The air under the piston is not all exhausted into the outer atmosphere, but some is held as a cushion so that the table is almost on the point of reversing its motion when it strikes.

Production Hints For the Molding Machine

Particular Stress is Put Upon Keeping the Machine Well Oiled and in Good Repair

By W. J. MacNeill.

A MOLDING machine by itself is not a cure for all molding troubles. If properly used it will prove to be an investment which will pay handsome dividends through increased production. But as the pattern is the most important factor in making a mold, the production obtained from molding machines will depend on the condition of the patterns. Do not expect maximum results from your molding machine installation unless your pattern and flask equipment is in first class shape. Use metal patterns or matchplates wherever possible and watch your flasks carefully. If your patterns are gated properly and your flasks kept in good repair your molding machines will more than fulfil your expectations.

To assist our customers in the matter of patterns, the Rapid Service Department has foundry experts available to advise you regarding the proper method of rigging up the job, and tell you what production you can expect on Rapid machines.

The first Rapid Air Squeezer Molding Machine was built for use in the Federal Malleable Foundry. It was designed by practical men, who desired to correct the faults of the molding machines then used, and produce a machine that would be faster than any other.

The results obtained from the first machine, created such a demand for Rapid Squeezers that the Federal Malleable Company was soon obliged to organize a Molding Machine Department to take care of the increasing business.

That the designers' ideas were sound is proved by the fact that after three

Work done on the Mumford molding machine.

years the present machine is the same as the original. Some of the parts have been strengthened, and the design of some of the castings changed to facilitate molding, but the working principles are unchanged.

The leading characteristic of the Rapid is its speed of operation. This is due to the nature of the operating valve. This valve is of the slide type and is so constructed that the cylinder inlet and exhaust passage are the same size, thus allowing the piston to descend as rapidly as it ascends under the air pressure.

The machine is mounted on an 80-lb. railroad rail and is furnished either in stationary or portable types. The squeezer head swings in a horizontal plane and the squeezer plate is attached to an adjusting screw for regulating it for molds of different depths. These are factors in the speed of operation, for the fact that the head swings in a horizontal plane allows a closer adjustment between plate and flask than is possible on any type of squeezer. This not only adds to the speed of operation, but also effects a saving of air by reducing the distance the piston has to travel.

The piston and cylinder are eight and one-quarter inches in diameter, and are carefully machined, fitted and supplied with piston rings to eliminate any leakage of air.

The operating valve is located at the right of the machine, and the vibrator knee valve at the left. About 250 cubic inches of air at 80-pound gauge pressure are required for each squeeze operation.

The Rapid Squeezer is best suited for molding castings under 50-pound weight and will accommodate flasks as large as 30x24x14. It will handle match plates and gated patterns equally well. Rapids are extensively used for all sorts of molding in grey iron, malleable, steel, brass and aluminum foundries throughout the United States and Canada.

Recently a Jolt Squeezer has been added to the Rapid line. This machine is similar in size and construction to the plain squeezer, the Jolt effect being obtained by means of a three-inch cylinder and piston within the squeezer piston. An automatic air cut-off controls the piston, and insures rapid and positive Jolt action.

This machine has all the excellent features of the Rapid Squeezer with the additional advantage of being able to handle a wider range of work, because of the Jolt feature. The entire line of Rapid Molding Machines are manufactured and sold by the Federal Malleable Company, West Allis, Wisconsin.

How to Obtain the Maximum Productions With Rapid Molding Machines

1. Keep piston, swinging head and Rapid valve well oiled.
2. Use bottom boards and squeezer boards that will fit inside the flask.
3. Adjust top squeezer plate as close to flask as possible. One-quarter inch clearance between plate and squeezer board is sufficient for all purposes.
4. Keep adjusting screw nuts tight at all times.
5. Use tapered snap flasks.
6. To take up wear on Rapid valv tighten the brass bushing near top o valve stem.

What The Arcade People Say About Machines

Specially Adapted for Small Work. All That is Required is Lots of Room and Plenty of Bottom Boards.

THE MODERN Molding Machine is built to produce molds usually made in snap flasks by bench molders. It is a simple inexpensive machine that any unskilled laborer can learn to operate, turning out molds at a great speed.

The castings made in this way are very much more accurate than castings produced by the bench molding process, and where the castings have to be machined, a large percentage of this cost is avoided. One customer of ours reports that he saves 33 1-3 per cent. of his machine expense by reason of the slight variation in the castings.

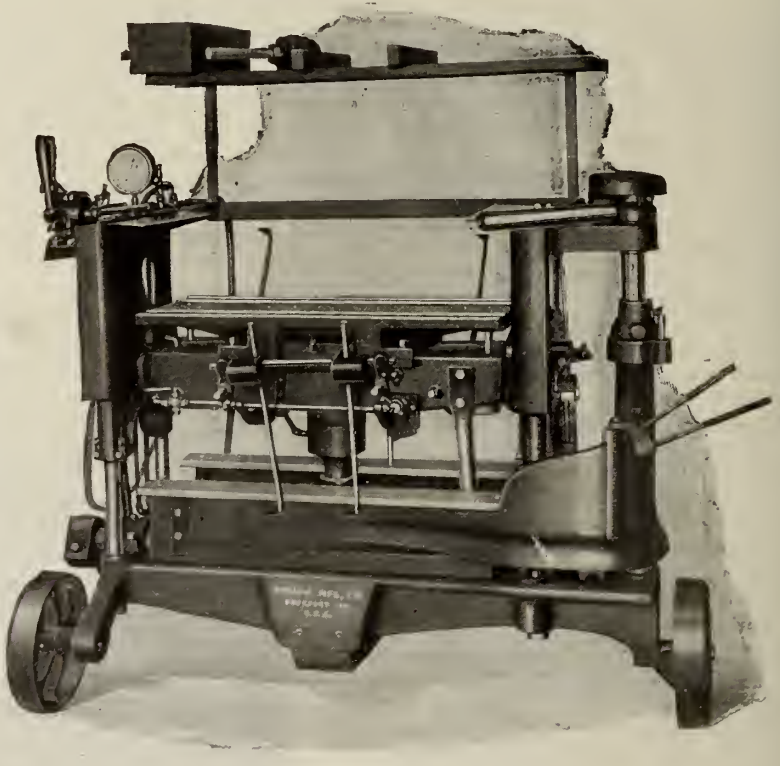
Being an entirely mechanical process, the making of the molds is accomplished with a regularity that lowers the number of discounts in a day's work to an amount that is hardly to be considered.

The patterns used are in the form of pattern plates made from regular gated metal patterns by a simple process which we have developed. We give instructions regarding this process to every purchaser of our machines, and are always glad to have the purchaser send mechanics to our plant to see the machines in actual use in our foundry.

We use two systems by which w produce either composition or white met al pattern plates, according to the natur of the patterns. The patterns made i this form are not subject to the damag of ordinary patterns and are cheape in the long run. We prefer to make th first set of pattern plates that is use on the machine sold so that the pur chaser can have a model from which t work. For this we make a charge cover ing the actual cost.

The MODERN Molding Machine re quires no special foundry equipment aside from a plentiful supply of botto boards and floor space on which to plac from 200 to 300 molds.

In foundries where a compressed ai system is in use we strongly recommen the purchase of the Arcade Pneumatic Vibrator with automatic trip attachment to the MODERN Molding Machine. This device automatically vibrates the pattern as soon as the sand in the mold is pressed to the proper density and continues in operation until the patterns are withdrawn from the sand. Considering the great advantage of this device the additional charge we make is very small.



An Arcade modern molding machine.

A Pioneer In The Molding Machine Field

Many Features of These Machines Are Hard To Improve Upon.

AMONG the earliest of molding machines seen in Canadian foundries was the Farwell squeezer, manufactured by the Adams Company, of Dubuque, Iowa. This machine was operated by hand, but was a big advance over the method used before it.

The original design of the Farwell Molding Press, as presented many years ago, introduced several new and valuable features which are now standard.

Inter-connecting the lever and the presser head so that to bring one into position, automatically brought the other into position, was a new feature.

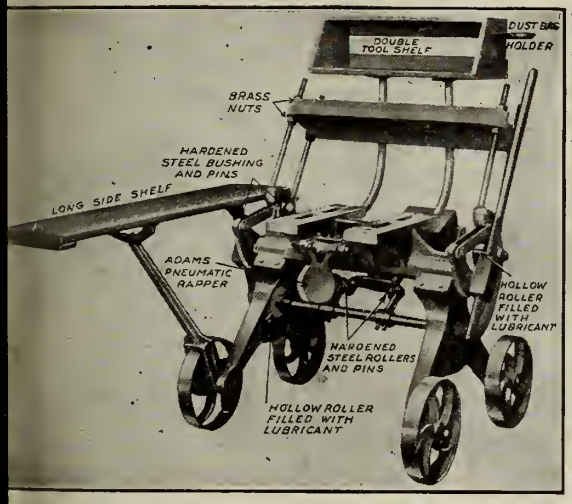
Bringing the pressing lever to a horizontal position so that the operator simply stiffened his arm and leaned his weight upon the lever when pressing the mold, was a new and valuable feature.

A leverage mechanism, which was rapid in action, yet so powerful that even a light weight operator could easily press the larger sized snap molds, was a new feature.

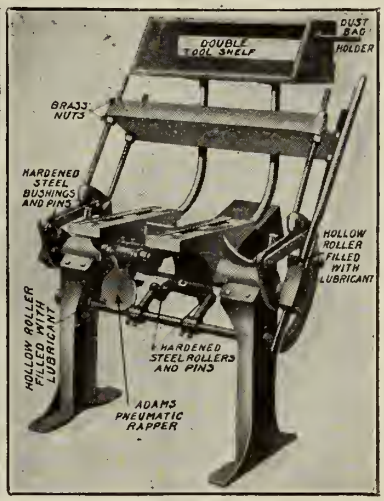
A machine strong enough to withstand the most severe usage, and yet light enough to be easily moved along the sand heap by the operator, unaided, was a new feature. These features have never been improved upon.

The Adams-Farwell 32-inch and 36-inch Double Rod Molding Presses add two new sizes, and are new in design. The improvements lead to greater durability and greater ease of operation by the introduction of anti-friction bearings. All the tested and valuable features of the old Farwell Molding Presses are retained.

No one can say that the original machine was deficient in durability for there are thousands of these machines in use that have earned for their owners many times their cost.



Portable type Adams-Farwell molding press.



Stationary type of same.

The Beardsley-Piper Sand Slinger

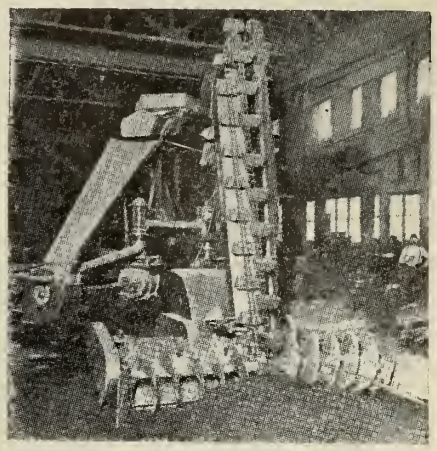
Delivering the Sand Into the Mold by Mechanical Force Instead of by Gravity.

THE illustrations show the centrifugal sand thrower which dispenses with gravity by forcibly throwing sand into the mold. This is not a molding machine, but is simply a device which can be used in conjunction with any type of machine with the exception of the jolter, in which case its services would not be of much use. Like the gravity machine, it can be used on floor or bench work as well as on the machine, and as much sand conveying as is required can be attached. The one shown is for a complete tractor type of thrower.

The sand heap is put in shape the same as in any molding work, and the machine begins at one end. The operator holds the movable arm in his hands and directs it to wherever he wants the sand. The conveyors, as will be seen take the sand from the middle of the heap and carry it up to the hopper. The screws shown on the two sides of the conveyer are right and left and as the conveyor carries the sand upward these screws bring it from the sides to the conveyor, thereby cleaning up the floor. As the sand is used up the machine moves towards the heap under its own power. This machine is manufactured by The Beardsley-Piper Company, 312 Union Park Court, Chicago, Ill., and is made in two types, the stationary and the tractor. The company's description of the tractor machine will convey all the essential points of the two, as the stationary type is lacking in those features which would not be called for in a plant equipped with sand conveying systems, etc.

Tractor Machine

The Tractor type machine travels into the sand heap under its own power, collecting the sand from the floor by means of a right and left hand sand cutting screw conveyor, which conveys the sand to the center of the machine, where it is elevated by means of a bucket elevator and deposited on to the screen of an oscillating riddle. This riddle is so constructed that scrap, gaggers, cores, etc., which are in the sand, will stay on top of the screen and work to the front and where they are deposited into a chute and then into the scrap box which is mounted on the main arm.



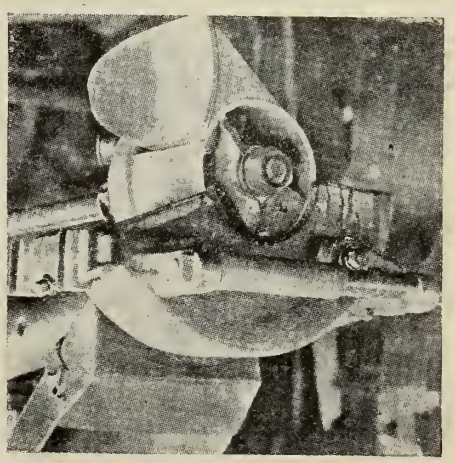
Rear view of machine, showing conveyors and discs.

The riddled sand is conveyed by the oscillating riddle into a hopper mounted on the impellor arm, above a belt that conveys the sand into the impelling head, which discharges the sand with centrifugal force into the mold at the rate of ten cubic feet of rammed sand per minute.

The ramming capacity of this machine can be regulated by the speed at which it is fed into the sand heap.

Size of Machine

Our standard tractor is known as a nine-foot machine, that is, it will work into a sand heap that is nine feet wide. The working radius of the arms is



Sand-throwing head with portion of hood removed

nine feet, that is, the machine will ram any flask or flasks 34 inches high that can be placed within one-half of a circle that is eighteen feet in diameter.

Note—The width of the machine, flask height, and length of arms can be ordered to suit any special conditions.

Operation of Machine

A laborer can be taught to operate this machine in a few hours, as its operation is very simple.

The ramming head can be swung into any desired position with very little effort on the part of the operator as the two pivots are equipped with ball and Timken roller bearings. This enables a lateral movement of the head to any desired position over the mold.

The motors are controlled from a switch that is located convenient to the operator.

Ramming

The desired density of the sand in any part of the mold is controlled by the speed of the paddle in the impelling or ramming head and the operation of ramming head over mold. For instance, if it is desired to ram hard or very dense, the head is moved faster over that part of the mold. If it is desired soft or less dense, the head is moved slower over that part of the mold.

It is customary to have a drag pattern on one side of the center line of the machine and a cope pattern on the opposite side. In this way the drag is rammed and as it is being removed the cope is being rammed, and while the drag is being rammed, the cope is removed and so on.

Drag and cope patterns are usually mounted on trucks and move with the machine proper. No additional ramming is required as in other molding machines.

Construction

Our machines are constructed of the best materials adaptable for their particular service and all working parts are so constructed as to protect them from sand.

The impeller arm has Timken bearings throughout, hardened and ground steel gears, lubricated by a splash oil system.

All machines are carefully tested in our own factory before they are shipped and are fully guaranteed as to our material and workmanship.

DUPLEX HYDRAULIC PUMP

A serviceable hydraulic pump that has been designed for a dual purpose has been placed on the market by the Charles F. Elmes Engineering Co., of Chicago, Ill. It is provided with a high and a low pressure cylinder, designed to give a maximum pressure of 5,000 pounds. Its adaptation to rapid production is in the possibility of speedily raising the ram to the work by means of the low pressure cylinder and changing over to the high pressure when the resistance is reached, this change taking place automatically. The pump is operated by a small ¼ H.P. motor located on the frame.

The Nicholls Molding Machine

Jolts, Squeezes, and Draws the Pattern With One Valve.

THESE molding machines have no gears, toggles, cams, springs, canvas or sheet metal guards, small leaky valves, balance springs or small complicated parts or adjustments to make. Easiest on operator, quickest to operate, and most economical on air consumption.

This machine can make four or five molds with the same amount of air that is required to make one mold on some other machines.

We use the engineers' type of valve, and a patented composition piston ring, and the machine is absolutely air tight in all parts with the full pressure on.

This machine has a substantial base and an absolutely positive jolt without any rebound.

The head swings in and out horizontally with a ball bearing joint top and bottom.

Has least number of working parts.

Head moves around horizontally with slightest effort.

Machine jolts while operator is shoveling in sand.

Iron ram head (no warping) is perforated and serves also as tool and dust bag holder.

No obstruction to prevent operator working up close to the machine.

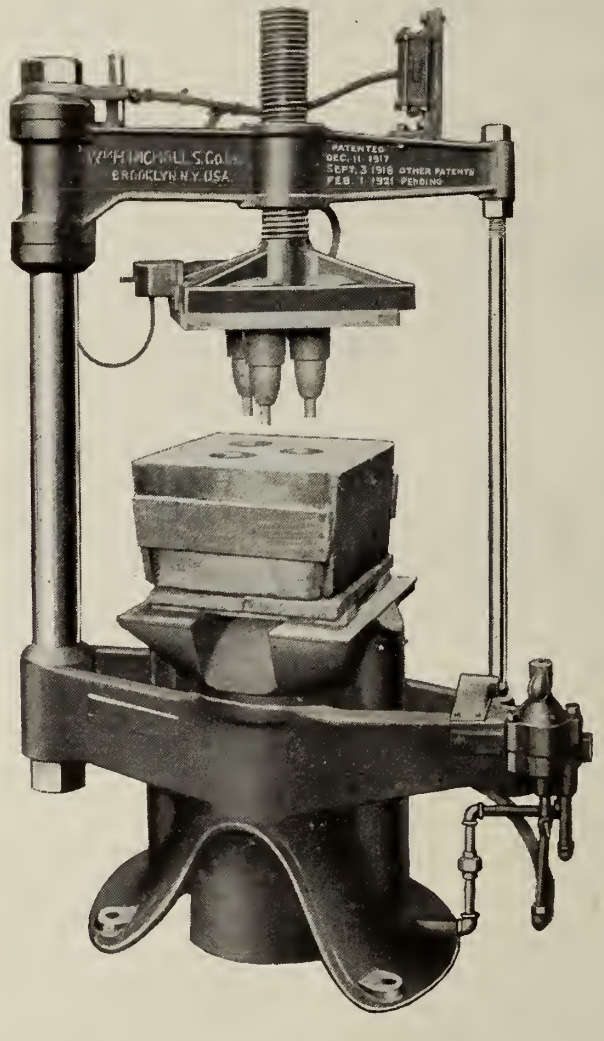
All parts shed sand freely.

Steel caps on plunger head can be readily replaced.

This machine is used for light split pattern work, stripping plate, double-faced match plates, and gated patterns on a hard sand match. Made in four sizes.

Stripping Plates vs. Split Pattern Plates

Castings other than the plain shallow variety can be made in quantities more successfully with stripping plates than on split pattern plates. Stripping plates in most cases cost a few dollars more to make, but can be as quickly changed on a suitable machine, and by use of them eliminate numerous troublesome conditions.



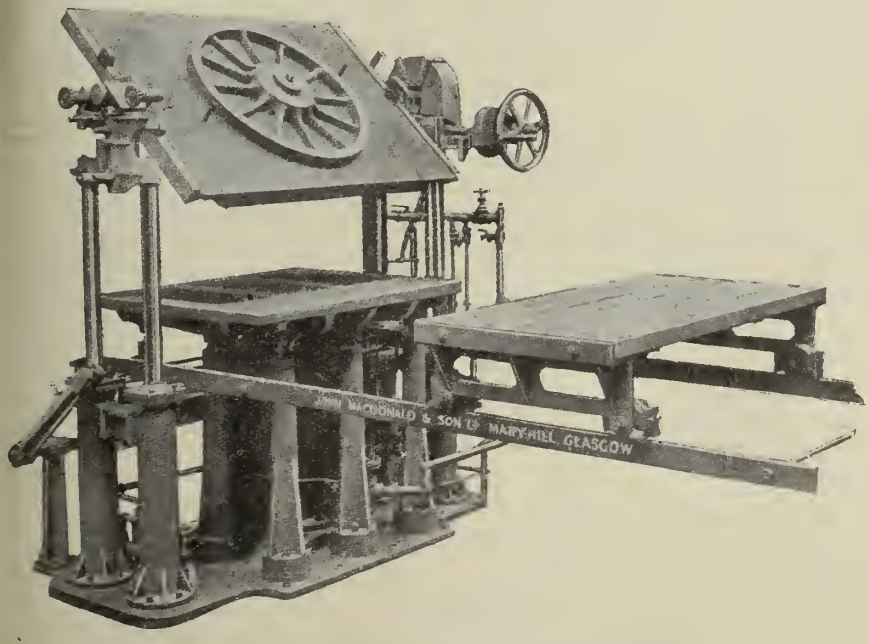
The Nicholls combination jolt and squeeze machine with pattern-drawing device.

A British Make Of Molding Machine

The Mold Carriage Travels On Ball Bearing Wheels Over Straight Track.

No. 16 "AJAX" Pneumatic Jarring Turnover and Pattern-Drawing Moulding Machine consists of a substantial base plate carrying main jarring cylinder, four side cylinders, and eight heavy impact columns, the upper ends of which are provided with special cushion impact blocks. The columns are equally distributed, giving practically a complete table surface impact, and thus ensuring against vibration and overhang. The main cylinder is fitted with a ram which carries the main table. The latter is a robust well-ribbed casting, to provide against vibration. The side cylinders are fitted with pistons and powerful side rods suitably connected to ensure unity of lift; these rods carry the brackets supporting the turnover table, a steel plate 1 in. (2.5 cm.) thick, backed with 3 in. by 5 in. (7.6 × 12.7 cm.) teakwood battens. The table is turned by a phosphor bronze worm wheel with two starts, and a steel worm coupled with a compound gear and 20 in. (50.8 cm.) hand wheel, which arrangement ensures the heaviest loads being turned with ease. The worm and gears run in an oil bath, and are provided with suitable covers for sand protection. The reciprocating or jarring action is controlled by an automatic air governed valve with a fixed stroke, but adjustable for force of blow from the lightest to the heaviest possible. The valve is also fitted with our latest patent air-governed safety device, which securely locks it against any movement whilst the separation of mold from the pattern is in progress. The mold carriage has cast-iron ends fitted with ball race wheels. The top is teak, 6 ft. 6 in. by 3 ft. 1½ in. by 2¾ in. (198.1 by 95.2 by 6.9 cm.) making a very substantial mold carriage. The construction of this machine makes it suitable for heavy foundry duties. The machine is supplied complete with 2 in. (5.1 cm.) vibrators, two blow cocks, all necessary piping, control cocks and spanners.

These machines are built in Glasgow and delivered to the Canadian trade through Vickers, Limited, Montreal.



No. 6 "Ajax" Pneumatic jarring, turnover and pattern-drawing machine.

WHERE MONEY COMES EASY IT GOES EASIER

Speaking about the big hauls which are likely to be made out of our oil find and other mining opportunities in the north country, reminds us of the gold rush a couple of dozen years ago to the Klondike river, away up in the Yukon district, of what was in those days known as the Northwest Territories. Gold was said to be lying in the sand on the shore of the river and along the bottom under the water. Some very nice hauls were made, but it was something like following the horse races; it cost more than it yielded. Some fellows made quite a few thousand dollars, but on the whole there were more dollars taken into the district than were taken out in the form of gold nuggets. But I am getting away from my story; the expense involved was a big drawback. Sometimes a prospector would be having a streak of good luck at the tail end of an unsuccessful season and in the hope of making good he would linger a little too long and miss the last boat for civilization, and then he would have to remain all winter, in which case he would easily use up what he had saved during the summer. The prices asked for supplies would not seem so out of place now as they did then, when we could get a good suit of underclothes around these parts for about a dollar, but the profiteer flourished then as now and of course it was not all profit, as it cost a lot to get the material up there.

A few items clipped from the news column of the Klondike Morning Times published at Dawson City and dated August, 1897, will be of interest. Here are some extracts:

Doc. Deadeasy has bought a half interest in Thirty Willie's claim for $270,000.

Canned peaches at Soapine Sam's only $1.40 per can.

"Cincinnati Charlie took out $1,460 day before yesterday.

"Pittsburg Phil is putting up a shack at the corner of Pneumonia avenue and Easy street.

"California ham at Soapine Sam's only 20 cents per ounce.

"Parson Doolittle is conducting a series of poker parties at his residence on Castoria avenue.

"Two gentlemen from Bonanza Creek shot all the windows out of the Hot Number Saloon Sunday night. They departed without leaving their names.

"Flannel shirts at Soapine Sam's only $12, for this week only.

"Cariboo steak with onions at the Greyhound Restaurant, $3.00.

"Col. Sandwich Barnes has gone to the woods back of Indian Village to get out logs for his new opera house, which will be built on Broadway, near Red Shirt Boulevard in the spring."

The market quotations taken from the same publication were also interesting, suggesting the advisability of prospective emigrants buying a few things in advance to take along with them. Here are a few of them.

Selected Market Quotations

"Corrected weekly by the Aurora Borealis Commission Company, 14 Arctic Square, Dawson City.

"Flour, per ounce, 65 cents.

"Corn meal, two pounds for $5.00.

"Whiskey, per quart, $16; per drink, 50 cents; per half drink, 35 cents.

"Meats—Market steady; beef running a trifle higher than last week; pork still on the hog. No sales less than $1.37 per pound. Cariboo steak $5.00 per pound; mule cutlet, $1.10. Dog tenderloin, $2.40.

"Dried apples, 60 cents a grab.

"Beans, 2 cents each.

"Coal oil, 11 cents per smell.

"Lemons, $2.00 each; 3 for $5.00.

"Salt, 1 cent per pinch."

The fellow who propounded these prices probably thought he was springing some surprises, but let him dig up a bottle of booze now and see what he will say.

Making a Large Flanged Elbow Mold on a Jolter

Showing the Utility of a Jolt Ramming Machine in Quantity Production of 18-inch, 90-degree Elbows, Compared With the Hand Ramming Process Formerly Adopted.

By John H. Eastman.

AT THE risk of incurring the enmity of the patternmaking fraternity, recent articles in this series have advocated and described the advantages of molding various types of castings without the aid of a pattern, the cost in that department being in many cases reduced almost to the vanishing point.

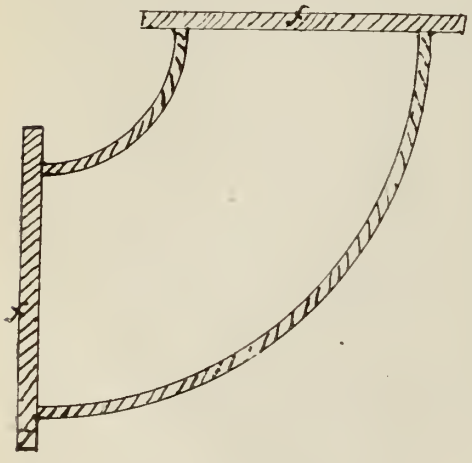


Fig. 1.—90 deg. Condenser Elbow 18 inches in diameter.

In the case of the 18-inch, 90-degree condenser elbow shown at Fig. 1, however, the wood butchering craft recovers prestige to such an extent that the territory regained more than compensates for their previous losses. Having thus, as it were, concluded an armistice, we will drop the metaphorical style, and finish the story in plain foundry slang.

A first order of one hundred and sixty castings, subject to extension ad lib, was placed, the terms of delivery and competition price necessitating low production cost and rapid output.

Under ordinary jobbing foundry conditions a casting of this kind weighing seven hundred pounds, would be around a day's work for a molder, providing you had a good selling figure, and if the customer would be satisfied to wait till the millenium for the completion of the order. In the case under discussion, however, a minimum output of four elbows daily in proportion with accompanying parts, was necessary, hence the need for a highly finished pattern of substantial design.

Figure 2 shows the pattern placed on a jolt-ramming machine table, with the drag mold rammed up on the face board, struck off, and the bottom plate placed into position, attention here being called to the design of the pattern at the core prints. As will be noted, the prints are the same width as the extreme diameter of the flanges, a twofold object being thus gained, namely, the necessity for chaplets was avoided, owing to the perfect balance insured by the extra weight and size of the coreprints, and also, (of much more importance), the risk of crushes was entirely removed.

By this method the skill required in molding these castings was about equal to that called for when molding a magnified sashweight, the procedure being, in effect, the molder and helper together would start in the morning and jolt four drag molds, one minute's jolting sufficing for each, as compared with approximately thirty-five minutes hard work when hand rammed.

They would next, with the assistance of the crane driver, set the four cores to place, following that job by ramming up the four cope flasks, the molder's main share being to set the few gaggers needed around the edge of the joint in general, and behind the flanges in particular, to do the little finishing required after the patterns were drawn, brush the blacking on, dig out the runner and riser heads and attend to the clamping and pouring.

The helper lined up the patterns with facing sand, filled up the boxes with floor sand, and attended to the jolting. As shown in the sketches, the flasks were of cast-iron, fitted with journals to facilitate handling by slings and beam, and the cope parts were made to eliminate the necessity for raised runner and riser boxes, the few extra inches depth of box and sand being the merest trifle, and of no consequence to a conscientious worker like a good jarring machine.

The heavy riser heads insured good solid flanges without any occasion for rod feeding, while in the matter of vents

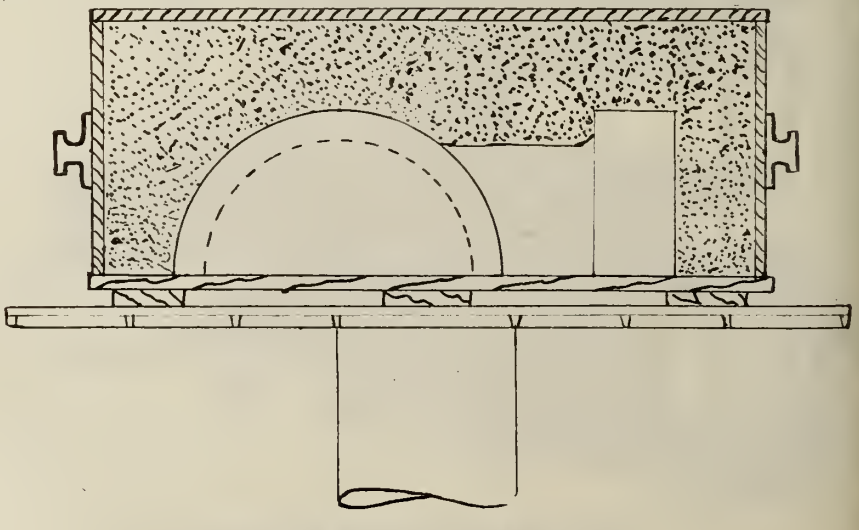


Fig. 2.—Drag half of mold on machine table.

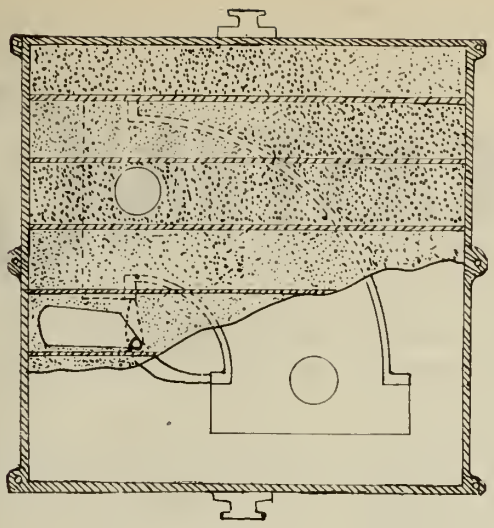


Fig 3.—Cross section view of assembled mold.

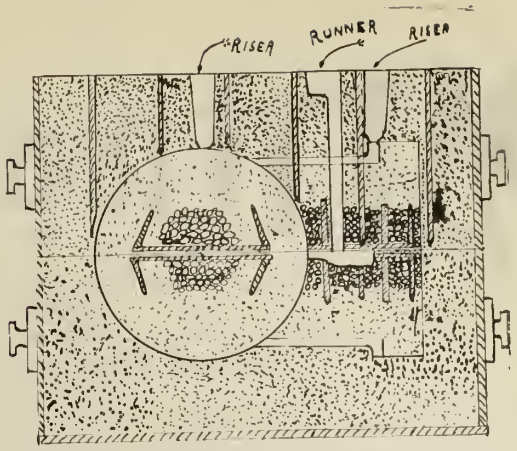


Fig. 4.—Composite plan view of assembled mold showing gates and risers.

a layer of coke was put into each half core mainly to save good core sand and to keep the cores as light as possible, a little time in drying being also saved on this account.

No special analysis was called for, the regular ten per cent. charge of semi-steel approximately 2.15 silicon, as used in the mixed class of work turned out by this company, serving the purpose admirably.

Owing to the fact that the company decided to grind the flange faces instead of machining, careful core jointing was necessary, three thirty seconds stock only being added to each flange face as finishing allowance.

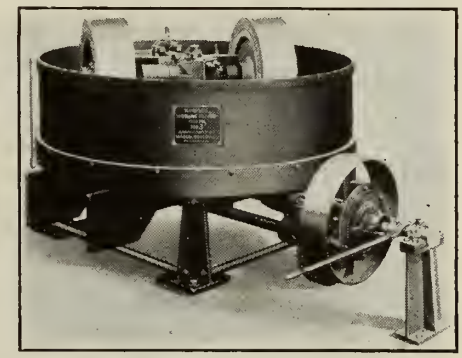
A NEW INTENSIVE SAND MIXER WITH 8 FOOT PAN

The National Engineering Company, 549 W. Washington Boulevard, Chicago, have lately developed and have placed on the market, a new and larger size of their Simpson Sand Mixer, which they call their No. 3 size, and which has an 8 foot diameter pan. This machine is shown on the accompanying illustration.

While this particular size of Simpson Sand Mill has been developed particularly for steel foundry purposes, it can also be used to advantage where large capacities are required in gray iron, malleable, brass and aluminum foundries, not only for facing and core sand, but for other foundry sand mixtures, as well as for the preparation of daubing to line cupolas, furnaces, etc. The No. 3 Simpson Sand Mill is the result of considerable experience in building machines of this type.

The No. 3, 8 foot Simpson Sand Mill will produce the maximum capacity. The time of mixing is brought down to a minimum, because of the ideal mixing action brought about by a combination of plows and mullers. The horse-power is very low compared to the capacity, which is increased materially by the use of the patented automatic discharge which has been one of the attractive features of construction in Simpson Sand Mixers. Most of the parts in the No. 3 Simpson Mill are of cast steel. It is built exceedingly strong and is well-made and able to give continued service with a very low cost for maintenance, as well as producing the maximum capacity, with very little labor, as far as the operation of the machine is concerned.

The machine will produce the very highest quality of mixture, giving uniform results because of the thorough distribution of any new sand or binding element that is to be mixed. The National Engineering Company have been manufacturing for some time three other sizes of their Simpson Sand Mixer, including their No. 0. 3 foot diameter, No. 1, 4 foot diameter, and No. 2, 6 foot diameter, so that they are in a position to furnish any size for any foundry, for the preparation of facing sand, core sand, and other sand mixtures, in foundries producing steel, gray iron, malleable, brass and aluminum castings.



No. 3 sand mixer.

LIGHTING MEDIUM

Speaking on acetylene gas as a lighting medium, the Daily Telegraph, Sheffield, England, states as follows: For country houses, the acetylene gas plant is simpler and more easily worked than the usual dynamo and accumulator; while the gas has the advantage that it can be employed economically for heating and cooking. The light given by the flame is quite as white as the latest form of electric incandescent lamp and much whiter than either the metallic or carbon filament lamp. For mining work. where naked lights can be employed, the handy acetylene lamp is far before any oil lamp or candle. But, all that can be done by the complicated electrical plant can be done by the very much simpler acetylene plant. The acetylene can be generated as and when required by means of one of the numerous forms of generators on the market.

The Elk Fire Brick Co. of Canada, Ltd., Hamilton, Ont., have placed on the market a line of prepared calcine and fire clay.

A NEW STAMPED STEEL GAGGER

The United Compound Co. of Buffalo, N.Y., so well known to the foundrymen of Canada through their vent wax for venting cores, are now putting on the market a novel gagger, which should meet with success. It is made of steel, of approximately one-sixteenth of an inch in thickness, and an inch wide. This is stamped into the form of the letter U, with an opening of about half an inch. This half-inch opening is pinched in to about a quarter of an inch at every inch in the length of the bar. Bars of this shape are bent to a right angle and of whatever dimensions required. When completed, the gagger has a small surface to rest over the pattern when rammed into a mold, thereby giving little chance for it to scab off. It is light although rigid, and being irregular in outline, should take a good hold of the sand.

At the recent meeting of the council of the Engineering Institute of Canada, in Montreal, it was decided that the next annual meeting of the Institute should be held at Winnipeg in February, 1922.

PATTERNS AND CASTINGS

By W. P. ESSEX

A Continuation of Last Month's Article on the Progress of Metal Casting up to the Present Century.

IN THE June number of the "Canadian Foundryman," the writer briefly outlined some of the successive stages which marked the progress of the art of metal casting, from the earliest times to the fall of the Western Roman Empire, A.D. 476, and the introduction of the industry to other countries of Europe.

In the following paper an effort is made to trace its progress from the revival of the arts, in the Middle Ages, down to modern times.

While this is a most interesting period it is not our purpose to linger at any particular age, but briefly mention a few of the notable examples of the metal caster's art, and touch upon some of the historical incidents which have influenced the development and progress of the metal working industry in the past.

From the fall of Rome until the tenth century, the light of science and art in Europe flickered but feebly throughout the dark ages, and few notable examples of metal work, other than implements of war, seem to have been made.

Bridging the Dark Ages

Before the fall of Rome, Greek colonists had established themselves on each side of that narrow strait between the Euxine and the Mediterranean Seas, where in time a new empire was created, and the gorgeous city of Byzantium, which flourished for nearly a thousand years, was founded at the entrance to the Bosphorus.

The rise of Byzantium was due largely to its commercial activity, metal work was in demand for ornament, utensils and construction, and industries making articles of silver, copper, bronze and iron flourished.

Commerce was extended to distant countries by land and sea routes. Byzantium merchants in their own ships carried their wares to India, China and even more distant ports. But such unparalleled prosperity could not peacefully continue, rival jealousies forced the Greeks into many wars.

Successively held by Athenians, Lacadaemonians and Macedonians, the city was partially destroyed by the Roman Emperor Severus in 196 A.D., after a three-year siege.

In A.D. 330 the city was rebuilt by the Roman Emperor Constantine, who made it the capital of the Roman Empire and changed its name to Constantinople. In the re-building and beautifying of the world's new capital, all the resources of science and art were requisitioned. Greece, Italy, Egypt and Spain were compelled to contribute many of their choicest works of art in silver, bronze and rare marbles for its adornment. Artists, scholars and artisans, sculptured, studied and wrought within its walls, and Constantinople became the most cultured, populous and wealthy city in Europe.

Many of our modern improvements and conveniences were to be found there, as well lighted and paved streets, water systems, public parks, schools and hospitals.

The Byzantium artisans with intimate knowledge of the arts and crafts of the Greeks and Romans, were skilful metal workers and wrought in silver, copper bronze and iron. They worked together in large workshops and foundries producing many articles, both ornamental and of general utility for which there was a great demand in their trade with other countries.

An historian of Constantine's time refers to a number of statues which the Emperor commanded to be modeled for the church of St. Sophia. A "seated Christ" of one hundred and twenty pounds weight; the twelve apostles, ninety pounds each; four angels of one hundred and twenty pounds each, all of silver. There were besides a life size gold lamb; seven silver hinds and a silver statue of St. John the Baptist.

The history of the Byzantium Empire bridges over the dark ages in Europe linking the past with the future. The preceding sketch has an historical significance, as it was mainly through its influence later, that art, science and industry received its greater impetus.

A Few Early Century Examples of Bronze Casting

That the Britons had made some progress in bronze casting, at a very early date, is evidenced by a couple of cast bronze heads in the British Museum.

Fig. 1.—Panel from Baptistry Gate, by Ghiberti.

While they show Roman influence a contact, they are evidently of nati workmanship, which is not surprisin for the Britons had been taught the of bronze casting by the Romans.

A celebrated bronze statue of fifth century is that of St. Peter Rome. It is said to have been cast memory of the deliverance of Rome fr the Hun, by the order of Pope Leo who persuaded Attila to spare the Et nal City.

That the influence of bronze is civilizing and uplifting may sound strange. It is said of Charlemagne, that after conquering the Lombard and annexing Italy, in the eighth century, he sought to make his empire a centre of civilization and Christian faith, by stimulating every variety of ornamentation and establishing foundries for bronze casting.

The great bronze Buddhas of Japan, made in the seventh century are perhaps the most remarkable creations in metal of any age or people. One of the most famous is the colossal Buddha of the Temple of Nara, over eighty feet high and a marvel of workmanship. It is cast in pieces and (some travellers say) welded together, which is doubtful. The method employed in casting and constructing these interesting figures may be taken up in a later paper.

The Revival of the Arts.

In the latter part of the ninth century the light that had so dimly burned through the dark ages, begins to brighten, a revivifying influence is at work, stirring the latent desires and arousing the dormant and forgotten arts.

To the influence of the early church we no doubt owe much for the revival and development of the metal casting art. For in the desire to beautify their altars and shrines, the efforts of the best artisans in gold and silver were obtained and the making of church furniture and decorations in bronze was greatly encouraged.

We read that about the tenth century, Volwinus, a celebrated master workman in metals, was commissioned to cover the altar of St. Ambrogis at Milan, with a series of twenty-four gold reliefs, of scenes from the life of Christ.

Gold must have been plentiful in those days, six hundred pounds, it is said, was used in the making of a gigantic crucifix by the Archbishop Willigis, about the year 1000.

During this period Germany made remarkable progress in metal casting, for we read that as early as the year 1015 the Bishop Bernward of Hildesheim ordered a brass gate to be cast for his cathedral. And also a remarkable column of the same metal, which had a number of reliefs running spirally around the shaft from the top to the base.

During the twelfth century the art of bronze casting made further progress. And the methods employed at Dinant, where the highest degree of excellence had been obtained, were adopted throughout Germany and France.

About the year 1140 the Abbot Suger commenced the rebuilding of the Church of St. Denis, France, and gathered from all quarters of the land the most skilful artisans, including sculptors and bronze casters. The first brass cathedral doors produced in France were cast for this church.

The thirteenth century masterpieces of metal craft display a wealth of beauty and workmanship that has hardly been surpassed. Perhaps the most notable creation in metal of that time is the candelabrum in the cathedral at Milan, Italy, which is fourteen feet in height, the central shaft, from which branch the seven sockets for the candles, is supported from its base by four winged dragons. The whole being one mass of scroll work and figures, marvelous in design and execution.

The famous brass gates of the Baptistry at Florence, Italy, is another notable example of artistic modeling and molding. These wonderful gates are in two sets, each made up of twenty-eight sections or panels, each one being a perfect metal picture in relief and cast in one piece. They are practically the life work of the celebrated Ghiberti, an artist of marvelous skill in modelling and the working of metals. Nearly forty years was spent in the making of these gates. Ghiberti commenced work on the first set in 1403, which were not finished until 1424. In the same year he started on the second set, which were completed some twenty years later. The story of Abraham, a panel of the Baptistry gate

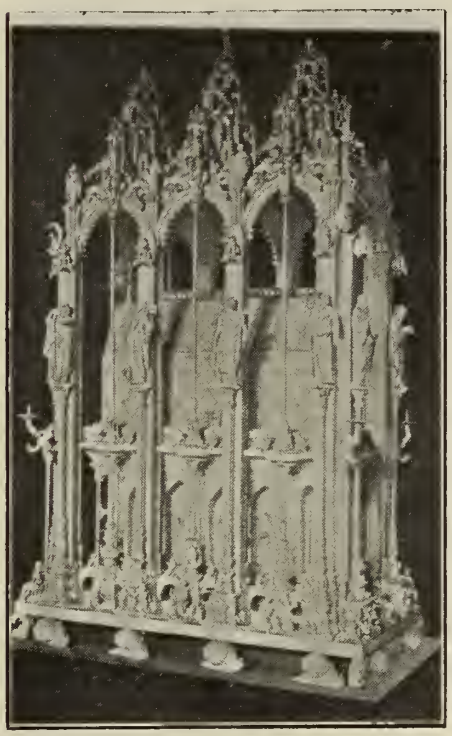


Fig. 2.—Shrine of Sebald from a cast in the Museum of St. Louis.

is shown in the illustration Fig. 1.

It is a singular fact, that while the process of extracting iron from its ores, and the making of it into wrought iron and steel had been known from the earliest times, there is no evidence before this period to show that iron had been smelted sufficiently to permit of it being cast. It was not until the beginning of this period (the fifteenth century) that the German "blow oven," an improvement on the old Catalan forge, made it possible to raise the heat to a point where the iron was sufficiently liquid to permit of it being poured into moulds that would give it shape and form. And it was years later before the process was cheapened to where it could be used in the making of utensils such as pots and kettles.

Greater Progress

In the year 1453, Constantinople was besieged and finally captured by the Ottoman Turks under Mohammed II.

The fall of Constantinople impelled large numbers of artists and artisans to seek other lands, in which to ply their arts and crafts. And through their influence and skill, science and industry received further stimulus, which was felt first in Italy, but quickly spreading throughout all Europe. In this period science and art made rapid advancement, and the industrial arts wonderful improvements and progress.

A celebrated historical family was that of Hermann Vischer's of Nuremberg, Germany, who, with his son Peter Vischer, the most celebrated, and his five sons, produced some exquisite works in bronze between the years 1450 and 1550. The skill of the elder Vischer is seen in a curious font cast for the church of Wittenberg in 1453. The genius and skill of Peter Vischer is shown in the beautiful gilt bronze shrine of St. Sebald in Nuremberg, this wonderful creation in metal was commenced in 1508 and completed in 1519. In the making of this remarkable piece of work Vischer was ably assisted by his five sons. An illustration made from a cast of this shrine in the Museum of St. Louis is shown in Fig. 2. Several other notable pieces of work were produced in this celebrated foundry, one of the most interesting is the heroic figure of King Arthur of England at the palace church at Innsbruck.

The Beginning of Iron Casting.

The mechanical arts made substantial advancement in the sixteenth century, progress is noted in the smelting and casting of iron, although charcoal was the only fuel in use. But with improvements in furnaces and the utilization of water power, the iron foundry industry grew in importance. Cast iron at this time had not entered into household utensils, which were mostly made of silver, pewter, copper and brass. A fine example of a cast brass kettle of this period is shown in Fig. 3.

An industry which flourished in England in part of the fifteenth and sixteenth centuries, was the making of cast iron grate backs. An illustration of one of these early castings is shown in Fig. 4. It would appear that the back was first moulded from a plain wooden pattern, the raised designs being pressed into the sand with a movable stamp after the pattern was withdrawn. An English writer on antique metal work says of this industry:

"There is a peculiar attraction about the castings made in Sussex in the days when the foundries of that county were in full work, and many villages were filled with busy patternmakers, moulders and founders carrying on a thriving industry in districts which have now been given up to the plow; for the Sussex iron fields were abandoned when the timber of the district was consumed."

An Important Craft.

Considerable advancement in the metal

working arts was made towards the latter part of the sixteenth century, and mention should be made of the Huguenot artificers who led all Europe in the mechanical arts. Examples of utensils, house-furnishings and trimmings of this period, in copper, brass and other alloys are too numerous for mention.

The artisan of this period was a man of esteem, and proud of his work and calling; this pride of craft led to the originating of the craft guilds, and from these no doubt our later trade unions sprung.

Fourding became so important a craft in England that the need of a guild of their own led to the organizing of the Worshipful Company of Founders, and in 1590 they received a coat of arms. They exercised jurisdiction over the manufacture of candlesticks, pots, lavers,

Fig. 3.—Cast Brass Utensil of 16th century.

ewers, spurs and buckles of brass and latten.

These old guilds flourished for many years and were instrumental in keeping the craftsmen of that day up to the mark, maintaining the purity of the metals and fostering the desire to attain the highest skill in artistic workmanship.

Digression.

Is the craftsman of to-day as proud of his trade or occupation as was the artificers of the past? If we could say "yes" to this question, there would not be the scarcity of good mechanics in the industrial ranks that there is to-day. It is not unusual in conversation to hear a mechanic deprecating the worth and importance of his trade and apologizing for the fact that he is a molder, coremaker or blacksmith, as the case may be. An old foundryman, complaining of the faults of one of his men, said "You cannot expect anything better of such a darn fool!" Insisting on his making this statement good, he said, "Well! if he hadn't been a darn fool he'd never have been a molder." Now this remark coming from a man of more than ordinary intelligence, while jokingly said, perhaps, reveals a tendency among mechanics to regard their trade, not with that pride of craft as did those old-time craftsmen, but as a condition that circumstance had forced upon them and whose unwilling servants they must be while necessity compels.

Seventeenth and Eighteenth Century Progress.

Events and incidents of historical interest, bearing on the metal working industries of this period, are many, and follow so closely one on another, that the most brief reference only is possible.

The prospect of the forests of Great Britain being depleted by the conversion of their timbers into charcoal, which was the only fuel that had been used for the smelting of metals, from the earliest times, was causing considerable alarm in some counties, which finally led to parliamentary action, which confined their operations to certain localities. Under these restrictions and the growing scarcity of charcoal, the British iron industries declined and iron was imported from Germany, whose larger forest areas made possible the smelting of iron for a much longer period.

An attempt was made in 1619 by Lord Dudley to smelt iron with coal that had previously been roasted or charred, for a fuel. The experiment was partially successful, but the cost too high. Further investigations, at this time, as to the practicability of charred coal as a fuel, were not continued. For the charcoal burners, alarmed at the prospect of finding their occupations gone, if partly burned coal could successfully be used in the blast furnace, put his near-coke equipment out of business.

Iron was early discovered in North America. Between 1620 and 1621 a blast furnace was built along the James River, Virginia, but the enterprise was abandoned before any ore was smelted. The first smelter to produce iron in America, was in Lynn, Massachusetts, about 1631.

During this period Eastern metal casters built up a reputation for making mammoth bells. One of the earliest of these enormous castings is the Bell of the Buddhist Monastry, Chi-on, in Kioto, Japan, which was cast in 1633. It is said to weigh over 165,000 pounds.

Copper which had been known and worked in America from the very earliest times was first commercially smelted in Massachusetts in 1648, and was later used in some of the small early foundries of the colony for making brass castings.

In 1677 deposits of iron ore were discovered near Three Rivers, Quebec. This iron was later smelted at the St. Maurice forges.

Continued attempts were being made in England about this time to find a substitute for charcoal and reduce the cost of making iron. It was found that the most economical results were obtained by raising the height of the furnace. A blast furnace operating in the Forest of Dean in 1680, is said to have been thirty feet in height, and working continuously for months making cast iron in pigs and sows.

Eighteenth and Nineteenth Centuries' Progress.

There is perhaps no other casting of historical interest so well known to readers, as the great bell of Moscow, which was cast in 1733. It is the bell of big bells, being nineteen feet in diameter and of the same height. Its computed weight is 440,000 pounds. Another big bell, also in Moscow, the largest in actual size, is said to weigh 128 tons.

Probably the first iron works in North America to make castings of any importance, was the St. Maurice Forges of Cugnet and Co. This was a French company formed in 1733 for the manufacture of iron on the banks of the St. Maurice River, Quebec. Besides operating a successful forge plant, there was also in connection a foundry, where as early as 1750 iron castings of considerable importance were made, and also stoves, pots and kettles.

In 1740 Darby perfected the process of smelting iron with coke, and charcoal as a blast furnace fuel was soon after abandoned in England.

That little progress had been made in iron founding in the American colonies at this time, is shown by a report sent to the Lords of Trade, by Gov. Moore of New York, in 1767, which follows:

"Fort George, N.Y., 12th Jan., 1767.

"The little foundry lately set up near this town, for making small iron pots, is under the direction of a few private persons, and as yet is very inconsiderable."

The Bourbon Furnace, an iron works built in Bath County, Kentucky, in 1791, made cast pots and kettles, and later on cannon shot.

It will be noticed that all the large bells referred to were cast in the seventeenth and eighteenth centuries, and before leaving this period, mention should be made of another large bell at Meuguin, Upper Burma, India, which was cast in 1790. It is sixteen feet in diameter, and weighs 88 tons.

Some First Things of the Last Century. Conclusion.

In the first year of the last century, a patent was taken out in England for a machine to mold cast iron screws. J. B. Neilson's invention of the hot blast in

Fig. 4.—A Sussex back of cast iron dated 1588.

England, 1828, cheapened the production of cast iron by doubling the output of the blast furnaces with the same amount of fuel. The metal aluminum, which has become almost indispensable in foundry production practice, was dis-

covered by Wohler in the same year. In 1847 Daniel Massey, the founder of the Massey-Harris corporation, established the business in a small way at Newcastle, Ont. The first molding machine of the jarring type was patented in 1869, and in 1878 Jarvis Adams patented the first jolt machine.

We have made some strides since then. The last thirty years has witnessed wonderful improvements in metal casting and foundry practice, especially in organization and quantity production, and while many of the foundry operations of to-day were employed by the foundry artisan of the seventeenth century, it would tax our skill and resources to duplicate some of the productions of the ancient foundry.

G. F. STERNE & SONS NOW OCCUPY THEIR NEW REFRACTORY CEMENT PLANT

Messrs G. F. Sterne and Sons, manufacturers of high temperature cements, Brantford Ont., have just moved into their new plant in that city and have an optimistic view of the future. In fact they are optimistic regarding the present, having no complaint to make about the volume of business coming their way. This company started in a small way some years ago manufacturing stove and furnace cement. They supplied some of the largest manufacturers in Canada with this material and were forced on different occasions to secure larger quarters in order to supply the demands made upon them, until the large modern plant into which they have just moved, has been the culmination. Mr. G. F. Sterne and his son who has been his partner for some years are practical cement experts and know the practical end of the business from stem to stern. Mr. E. T. STERNE, B.Sc. A. I. C., F. C. S. who has recently joined the company takes charge of the chemical and analytical department.

Mr. E. T. Sterne, B. Sc. A. I. C., F. C. S. had not previously taken an active part in the enterprise having graduated from Queen's University, Kingston Ont., then taking a Post Graduate course at the University of Chicago. After this he returned to Kingston and took charge of the Department of Industrial Chemistry at Queen's University which position he held for two years.

During the war he became inspector of T. N. T. explosives for the Imperial Munition Board, in Canada, and for one year was technical representative on construction for the Director of Explosives, and later became chief chemist on operation at the enormous plant of the Imperial Munition Co., of Trenton, Ont. In 1919 he went to England as foreign representative of the Shawinigan Water Power Co., for England and all Europe, where he had a good opportunity to study world trade conditions.

Returning to Brantford on Christmas 1920 he took up the position of Technical Director for Messrs G. F. Sterne & Sons, and now that his knowledge and experience has been added to this organization, they are in a position to render first class service in regard to the supplying of high temperature cements and refractories, boiler compounds, iron-fillers and foundry specialities.

Mr. Sterne has a splendid laboratory and will be able to give adequate attention to any special product which

E. T. STERNE, B.Sc., A.I.C., F.C.S.

may arise in the foundry or in regard to the lininng and repairing of cupolas, furnaces or any place where heat resisting cements can be used. "Sternson" is the trade name of the products manufactured by this company and their uses include, not only cupola and furnace linings, but for repairing cracked and leaky crucibles, coating carbon electrodes in electric furnace work, etc.

In addition to refractories and cements the company also manufacture boiler compound and make a specialty of analyzing boiler feed water at their chemical laboratory.

STEEL SLITTING SHEAR

A special design of bench shear intended for use in machine shops, garages, etc., has recently been developed by the Dries & Krump Manufacturing Co., of Chicago, Ill. It has a capacity for cutting bars up to 3-16 by 2 inches, and will slit steel sheets up to No. 10 gauge. The shear is of all-steel construction, the frame being pressed out of one piece and offset to allow working on sheets of any length. Geared leverage is provided. The blades are 4½ inches in length and 5-16 inch thick, made of crucible steel. All parts are made interchangeable.

AN OLD FOUNDRYMAN GONE

Mr. George Beatty, President of the firm of Beatty Brothers, Limited, Fergus, Ont., died at his home in that town on Thursday, June 16. Mr. Beatty was born on a farm in Albany Township, 30 miles from Toronto, in the year 1846. He learned the machinist trade, at the works of Haggert Bros., Brampton, Ont., and in 1874 went with his brother Mathew to Fergus, where they founded the business which still retains the name of Beatty Bros. During the first four years they occupied a small building known as the Temperance Hall, but in 1879 their business had grown sufficient to call for a much larger plant, which was built in that year. As time passed, further extensions were required, and at the time of his death the establishments under his control consisted of two large modern shops at Fergus and three at London, Ont., one of which supplies all the castings for the others, and several branch storehouses and sales rooms in different parts of the world. Mr. Mathew Beatty died in 1886, leaving the entire burden of carrying on the business to Mr. George Beatty, who successfully ran the business until 1901, when he took in as partners his two sons, Will and Milton. Mr. Beatty was married in 1875 to Miss Martha Rutherford, who survives him, along with the two sons just mentioned, and Mrs. Sterne of Edmonton, Alberta. Ten grandchildren also survive.

Mr. Beatty was a life-long churchman and temperance worker, having served for many years as choir leader and Sunday School Superintendent at the Methodist Church, as well as serving on several occasions on the Quarterly Board. He was one of the most prominent citizens of Fergus, and for many years acted as one of the local magistrates.

FLOOR GRINDING MACHINE

A new design of motor driven grinding machine has been added to the lines manufactured by the Marschke Manufacturing Co., of Indianapolis, Ind. It is designed for heavy duty with the rotor of the motor directly connected to the drive shaft, which is mounted on four Hess-Bright ball bearings. The control for the motor is placed in the pedestal of the machine, the operating lever protruding through the front of the frame. Machine may be equipped with a suction fan when desired.

TOLERANCE PLUG GAUGE

A new tool, a tolerance plug gauge with replaceable ends, has been added to the lines of C. E. Johansson, Inc. These tolerance plug gauges of the smaller sizes, were formerly made solid, but the new type provides for the preservation of the unworn (No-Go) end, and refitting the tool with a new Go member. A locking device is used to keep the ends from turning when gauge is in use. This type of gauge is made in sizes from ⅛ to 47-64 inch.

B. G. NEWTON, Manager
A. R. KENNEDY Managing Editor

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

F. H. BELL, Editor
GEO. M SMITH, Advertising Manager

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Molding By Machinery

AS ALREADY announced, the present issue will be devoted to some extent to the subject of molding by machinery. This is just thought out for the purpose of interesting the prospective buyer and stimulating the idea of installing machines at an early date. The steel mill, the cement mill, and even the saw mill, will crowd the foundry out of its rightful place unless the foundryman can see his way to keep his foundry abreast of the times. The time was when a saw log was placed on two skids, and two men, one above and the other down in a trench below, ripped this log into lumber with a double handled rip saw. Skilful workmen could do good work by that means, the same as skilful molders can do good work in the foundry by the Armstrong system, but they are not doing it at present. Molding must be done by machinery if it is to continue being done at all, so there is no room for argument on the advisability of using machines. It is not our purpose to dictate what type of machine should be used, our office is simply to show what there is on the market in the way of machines, and to show in some way their adaptability to the different classes of work which they may be called upon to do. In addition to our own experiences and observations we quote some of the leading manufacturers of machines, deeming their knowledge of the highest order. Surely no reputable manufacturer would attempt to foist a machine onto anyone to do a line of work for which it is not adapted. An unscrupulous salesman might do this kind of thing and get away with it for a short time, but the company who retained this class of salesman, could not long survive.

As a matter of fact, all the material in this issue is reliable and by studying the reading matter as well as the advertisements and illustrations the prospective buyer should know pretty well which machine he wants.

America and the Golden Touch

THE United States is undoubtedly the wealthiest country in the world today in regard to gold coin, yet with all their wealth they are not prospering as they should at the present time. Unemployment is rampant and every effort on the part of the authorities is being exerted to right the wrongs which are supposed to be causing the trouble, yet the most optimistic of the manufacturers see little encouragement for hope of any change in the near future. The chief factor in the situation which is at the bottom of the whole thing is one which they are fostering in the hope of rectifying matters. Uncle Sam has been exporting more than he has been importing and as a consequence has been taking in more money than he has been paying out. He cannot eat money any more than King Midas could when he was blessed (?) with the golden touch. The result is that foreign money is at a discount in the United States. This makes it more difficult for foreigners to buy there and of course tends to aggravate the unemployment in the country. Now they put on an emergency tariff which is intended to keep outside goods from entering. This, of course, only adds fuel to the flame. It cannot but help add to the exchange difficulty and create a greater demand than ever for the American dollar. A temporary reduction in the tariff would seem to be the better course until such time as the exchange could right itself, which factor alone would give a big impetus to business. Every manufacturer approached on the subject knows this and tells the same story. They claim the new tariff is the most ridiculous thing they ever heard of, but it seems they have no means of preventing it. The American as an individual is usually the most optimistic of any race in the world. He is certainly not close-fisted and would divide his last dollar with a stranger if he saw that the stranger was in need. He has always been used to plenty and if he cannot have plenty he is all upset. The war made him too prosperous and now to have to go back to ordinary times is too much for him and he would just as lief do nothing, which is just about what he is doing. The industries of the United States are in many cases running below fifty per cent. of their capacity, and many business men talk of closing down entirely for a few weeks. Some of them look for a slight improvement in the fall, but most of them think it will be another year before conditions can return to anything like normal. They claim that there is a buyers' strike on and they are waiting for it to pass.

How Different in Canada

A FEW days ago the writer came down from Chicago, and in observing the cities through which he passed and talking to the passengers who took the train at the various stations en route, he saw and heard nothing but the same old story—"nothing doing." But after passing through the tunnel into Canada how different he found things! On the Canadian side of the St. Clair tunnel is the city of Sarnia. In this city are four good sized foundries. Mueller Bros. is a big plant which employed over a thousand hands during the war, and while they are not now running to their capacity, they are running 250 men five days per week. The Doherty Stove Works was running six full days per week with their entire complement of men. The John Goodison Engine and Thresher Co. who in normal times employ 160 men, but who some time ago reduced this staff to 100 men, working eight hours per day, took back fifteen of their old hands on July 2 and increased the working hours to nine hours per day. They feel confident that this increase in their working force can be maintained throughout the year.

The Holmes Foundry Co., a specialty foundry doing nothing but automobile cylinders and cylinder heads are

running to their full capacity, six days and nights per week. They employ 165 men and run two shifts. They are fully equipped with molding and core making machines. Six men in a gang put up 325 cylinders for a day's work. This does not look as though the automobile business was dead in Canada. Nothing is dead in Canada. Conditions in Sarnia are a criterion of what prevails all over this country. There is no boom here and in fact we are not as busy as we would like to be, but we are holding our own with any country in the world, and then some. Everything indicates that conditions will improve from month to month and that normal times will soon be with us again. In spite of the fact that the dry spell had an unfavorable effect on the small fruit, it has had no bad effect on the grain crops. The wheat crop never looked better. The only unpleasant feature from the farmer's point of view is that he can never again hope to get the prices which have prevailed of late years and he naturally objects to paying the prices which he is being asked to pay for the things he has to buy. This will, of course, make a difference in the implement business until such time as the prices of commodities in general come down to a level with those of the farm.

The Labor Situation

ACCORDING to the June issue of the "Labor Gazette," the beginning of May found unemployment among trades unions to be 16.27 per cent. of the total membership, as compared with 16.48 per cent. at the beginning of April, and 2.52 per cent. at the beginning of May, 1920. This, of course, shows that times are not to be compared with those of a year ago, but that they are slightly better than a month ago.

Returns from 5,000 firms indicated a slow but steady improvement. This coupled with the fact that living expenses are slowly declining is a hopeful sign. The slowness in the declining of prices is a mysterious feature. With raw material at pre-war prices the retailer should not find it necessary to hold up the prices the way he does. If the farmer, who is the real producer, is forced through foreign competition to sell cheap and the consumer who in most cases is the working man is forced through lack of employment to live on a greatly reduced income, in comparison with that he had a year ago, the middleman must, of necessity, fall into line. On the whole, Canada is a well-favored land compared with other countries.

British Research Association

"THE BRITISH Cast Iron Research Association" is an organization which was incorporated at Birmingham, England, on June 1st, 1921, and as its name implies, has as its objects: First—To promote co-operation amongst firms engaged in the various allied industries connected with the production and utilization of cast iron in Great Britain, with a view to the establishment of a scheme for scientific and industrial research. Second—The distribution amongst its members of technical and other information relating to the production, treatment, manufacture and utilization of cast iron. This necessitates the efficient co-ordination of the existing means of research and their further development. The work of the association will include the investigation of problems arising in the manufacture of pig iron, grey iron castings, malleable iron castings, semi-steel, chilled rolls, cast iron hollow-ware, cast iron pipes, light castings, etc. in such a way as to cover and include all branches of the cast iron industry. Successful and economic production of these materials is very intimately bound up with the question of smelting, annealing, furnace design and construction, refractory materials, molding sands, the economical utilization of fuel, and the engineering aspect of foundry work. All these and other subsidiary operations will be dealt with by the association, either directly or in collaboration with other research bodies. The cast iron industry is important, as nearly every other industry in the country uses its products. It should, therefore, possess the strongest and most progressive research association in the country. With the support which its importance deserves this should be readily accomplished. Every individual firm in Great Britain engaged in the production of cast iron should consider that it is to their vital interest that the association should have their practical support, because the result of its work must necessarily mean that the foundries which are connected with it will be in a position to deal with foreign or any competition on better terms than at present.

Prevention of Accidents

THE prevention of accidents in the various branches of the petroleum industry differs but little from accident preventions in any other industry in this country. Though there are some hazards in this business which are peculiar to it, most personal injuries result from general causes, such as the men falling, being struck by falling objects, and injured in the use of hand tools.

In analyzing the reports of 1,000 accidents in this industry, continues C. L. Turner in Petroleum Magazine, it was found that over 31 per cent. were due to the workers being struck by falling objects; 10 per cent. were caused by the improper use of hand tools; nearly 9 per cent. by men falling or tripping; and about 8 per cent. by the men being struck by passing objects. Injuries by stepping on nails caused 4 per cent. of the accidents.

Thus, about 62 per cent. of the accidents reported were caused by the fact that the workmen had not fully acquired the safety habit. Very few of these accidents could have been prevented by any engineering revision.

Many accidents in the production division of the industry could be avoided by properly instructing the workmen and by the issuance and posting of notices showing the methods of procedure in the different processes where accidents are likely to occur.

Unguarded belts and shafting are always a source of danger and should be avoided wherever possible. Thorough and complete inspection of motor trucks at regular intervals, and care in the selection of drivers will materially reduce the accident hazard in the automotive branch of the industry.

Suggestion Dont's

THE General Electric Co., Schenectady Works, used their shop paper to good advantage recently to help employees who were offering suggestions. They issued a series of "Dont's" which aided the employees generally in sending in more complete ideas for perusual. Here are the "Dont's" that were published:

"Don't make suggestions of a general nature without giving instances of how and where same may be applied.

"Don't get the idea that your foreman will be 'sore' because you make suggestions. The average foreman in this plant is a 'regular fellow,' and is usually glad to help you get your suggestions into shape for submission.

"Don't forget to put your building and check number on the suggestion blank.

"Don't forget to give drawing and part numbers and also the name of the apparatus to which the suggestion applies. This is of great help to us in investigating the suggestion.

"Don't forget that even a rough sketch is of great help in making your s[illegible]ar."

COMPETENT AUTHORITY AGREES WITH US ON THE SUBJECT OF TUYERES AND MELTING PRACTICE

Editor, Canadian Foundryman:

Noting the question asked you in the June issue of The Canadian Foundryman in regard to the shape of a tuyere of cupola, and the area of same, this is similar to questions quite frequently put to us, and we are very glad to see that your answer covers the question quite satisfactorily.

We have been for over twenty years manufacturers of cupolas using a flaring tuyere of the type referred to, and we have in our files a great deal of data regarding the melting capacity and efficiency of this cupola, all of which agrees with your reply to your correspondent. It is our theory, and we think it is borne out in practice, that the smallest area of the combined tuyeres should be ample and the result shows that the fastest melting and the most economical melting is with tuyeres of ample area, preferably flared. An area of one to four is none too large, and in our actual practice we use, in nearly all our cupolas, a larger area than this. What any manufacturer of fans may have to say about the area of a cupola is not necessarily correct, and we respectfully submit that the manufacturers of cupolas having, as they do a great deal of data on this subject, are better prepared to advise on this point than the manufacturers of blowers. We find there are still a good many foundry men who are consulting blowers' catalogues in their efforts to melt economically and rapidly instead of consulting the manufacturers of cupolas. If any user of our cupola (the Newton) is not getting satisfactory results we will always thank him to come to us for advice. We might say that in most cases the trouble seems to be insufficient air in volume. We will venture to say this is the trouble three-fourths of the time. Part of this is due to misunderstanding tables given in the blower catalogues and to not taking the cupola manufacturer into their confidence when the cupola purchaser installs his equipment. You are on the right track when you say: "What is wanted is to have the tuyere of sufficient area to admit plenty of air and then have the blower of sufficient capacity to deliver that air." That sums up the case in a nutshell. If purchasers of blowers would not try to economize on the size they would get far better results. If they get a blower too large they can easily slow it down. In our opinion, a good rule is to ascertain the size of a blower about right for the cupola and then buy the next larger size. Then he will be sure to have enough air, as the inside lining of the cupola burns out and enlarges the tuyere area.

GEORGE A. TRUE,
President Northern Engineering Works,
Detroit, Michigan.

WHERE COAL OIL GETS ITS NAME

Editor, Canadian Founryman:

I have just noticed a little thing in your article on oil in the June Foundryman, "As it is, it might be considered as a sort of liquid coal, hence the name 'Coal Oil.'" I wonder if that is strictly right? Did any of the big books say that? I have been carrying the idea around that coal oil derived the name from its first being made from the oil-bearing shales or coal. Kerosene is the correct name for oil refined from petroleum.

Answer—Perhaps the wording of my article was not as clear and precise as it should have been. Coal oil was known before the petroleum product, having formerly been distilled from bituminous shales and coal, and it was from the fact that it was taken from coal that it was called coal oil. When it was discovered that a similar fluid could be extracted from petroleum very few knew that a change had taken place and the name coal oil still clung to the new product. Early writers on petroleum made little comment on its origin, contenting themselves with saying that there was a difference in opinion as to its origin. Most later authorities describe it as having been formed by the gradual decomposition of vegetable matter beneath the surface of the earth.

Pelouze and Cohours, two noted chemists, have shown that it consists mostly of homologues of marsh-gas. However, since petroleum comes from decaying vegetation and coal comes from a similar source, and since coal oil is extracted from coal, and kerosene is extracted from petroleum, and since coal oil and kerosene are so near to one and the same material that the ordinary layman cannot distinguish the difference between the two, it is quite reasonable to conclude that coal and petroleum had their origin from the same source, although coal may have had a few million years of a start on petroleum.—Editor.

WANTS INFORMATION ON ELECTRIC FURNACE

Editor, Canadian Foundryman:

I would like a little information relative to the use of the electric furnace. Could you tell me if you know of anyone using this class of furnace to melt grey iron with and if so is it a success? Is it cheaper than the cupola, using coke, and would it be possible to install one of, let us say, one-and-a-half or two-ton capacity that would melt either steel grey iron or brass? What would be about the cost of installing same? Thanking you in advance for any information you may give me.

SUBSCRIBER.

Answer—I will leave this question open to be answered by any one who knows the electric furnace business sufficiently well to give a satisfactory answer. Electricity is a success without a doubt, but how it will fill the bill in this case is open to discussion.—Editor.

CONCRETE PILES

Hollow concrete piles are being made by a novel process in Los Angeles, according to the Engineering News Record. They range from 42 feet to 60 feet long by 18 inches to 20 inches outside diameter, with a thickness of about 4 inches. A solid point of reinforced concrete is made and stood on end in a high scaffold. Paper cylinders representing the internal diameter of the pile are then erected above the point and the reinforcement put in place. Cement-granite concrete is then applied by means of a cement gun, in stages of about 6 feet high. After standing from eleven to fifteen days the piles are picked up by a locomotive crane and leaned against a rack to season for thirty days. They are then transferred, still in the vertical position, to a rack on a barge for conveyance to the works. By these means it is hoped to avoid the cracking sometimes caused by upending piles cast horizontally.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question—I am a young man, served thirteen months in nickel-plating department of large firm in Ontario, under a man who did good work by using old methods, which are now considered too slow by the platers I have met. Through the death of this man I have acquired his position and my employers have intimated their intention of improving the plating plant so that we may handle present and future production more rapidly than formerly. The space at our disposal will not permit enlarging the plating room sufficiently to add to present capacity of the plant. Can you suggest any method which would help us increase production without occupying greater area of floor space?

Answer—There are several methods which may be employed to increase production in a plating plant without increasing the floor space. If you have been using the old type solution made from double nickel salt, as we presume you have, you can practically double your present output by using same number of gallons of more concentrated solution, employing single nickel salts to build up proper density, and some addition agents such as ammonium chloride, magnesium sulphate or sodium chloride to effect better anode corrosion. Higher percentage nickel anodes could also be used with this solution. With the old-time tried double sulphate solution it is not possible to use a high current density in plating, without burning the work or at least causing the deposit to form in a very rough or granular condition quite unfit for either decorative or protective purposes. Low current densities naturally mean slow deposits, longer periods for plating, more equipment and greater floor space than when more rapid plating solutions are used. It is obvious that in order to economically employ concentrated nickel solutions capable of rapid deposition we must have a greater amphere capacity at the dynamo. If your source of electrical supply is but little in excess of present requirements it would be necessary to increase your plating power sufficiently to care for total capacity of the plant when equipped with highly concentrated solutions. Small pieces not requiring high grade finish can be plated in a rotating cylinder, several types of rotating plating machines are available and each has some good feature. In buying this class of machine we would advise purchasing from a reliable plater's supply house to insure satisfaction and service during the early period of your experience with the apparatus. Possibly the most practical method of increasing production in a plating room with limited floor space is to employ agitation in one form or another. What we have said above relative to slow results obtained from simply double salt nickel solution can be applied to the still solution of any concentration or composition when compared to the agitated solution or solution in which the cathode is caused to move by mechanical means. A motion plating machine facilitates the use of higher current densities because the motion prevents the continual adherence of the hydrogen bubbles on the cathode and maintains sufficient circulation of the plating solution to mix the dense solution from the vicinity of the anodes with the partly depleted solution around the cathode. Unskilled labor can be more safely employed. Deposits are more uniform in structure. Recesses are more readily covered with desired thickness of metal. Facilitates the use of practically full voltage of the generator, whereas, with a still solution we usually employ only one-half or two-thirds the voltage of the machine. Motion plating machines of some types can be so placed that less than one-half the floor space occupied by same number of still tanks will suffice.

THE AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers for 1920-1921.

President—Mr. T. G. O'Keefe, 147 Dupont Street, Toronto.
Vice-President—Mr. Harry Cresswell, 61 Armstrong Avenue, Toronto.
Secretary-Treasurer—Mr. Charles Kemish, 271 Boston Ave., Toronto.

PLACE AND DATES OF MEETING

The Occident Hall, corner Queen and Bathurst Streets, second Thursday of each month, at 8 P.M.

Question—Can you oblige me by publishing a formula for coloring iron, steel, brass and bronze by using a lead mixture? I desire a variety of colors and can produce them by obtaining sulphide films or oxidizing the article in usual manner. These films do not meet my requirements. I require a lead film capable of resisting slight wear unprotected by lacquer. Kindly state whether more than one color may be obtained by using different metal base.

Answer—The following formula is one used in England and was obtained by the writer specially for your purpose. If you do not obtain satisfactory results from it after careful tests we would advise you to try electro deposited lead films. The latter will give you a reasonably durable film while the formula here given is intended only for coloring.

Dissolve 15 ozs. of lead acetate in one-half gal. of hot soft water. Cool to approximately 100 degrees Fahr. and immerse the article which is to be colored. Agitate during period of treatment. Color should form gradually and depth of color depends upon the thickness of the film obtained. The solution gives iron a bluish tint resembling steel, zinc becomes brown; slow coloring ensures uniform tint. If temperature of solution is raised slightly above 100 degrees Fahr. and an equal quantity of sulphuric acid is substituted for the lead acetate common bronze treated in the solution will become red or green, the color being very durable. Bronze may be made to resemble marble by heating the bronze to about 100 degrees Fahr. and covering same with solution of lead thickened with gum tragacanth, then subjecting the bronze piece to the action of the lead bath mentioned above.

Furthermore, if the temperature of the solution be increased to 180 degrees or 200 degrees and eight ounces hyposulphite of soda be added per gallon of solution, the results will possibly be more pleasing to the eye, though no more durable than films produced more slowly by simple formula as originally given here.

Question—Our black nickel solution has been giving us more or less trouble of late. The deposit flakes off. The flaking often occurs when pieces are being assembled.

Answer—Unless yours is a very unusual case you may be satisfied that one or both of two causes require your attention. Current density is too high during plating period or solution is too acid. Either of these conditions may easily have become pronounced in spite of close casual observation on your part. Examine the rheostat on the black nickel tank, if the voltage at the tank has accidentally become boosted, then, naturally, the current strength has increased and imperfect results follow. Excess acid may be present as a result of the use of old litmus paper which has not correctly indicated the acidity. We would advise heating the solution to near boiling point and neutralize the acidity with zinc carbonate.

Question—I have been using a cleaning compound for work to be plated, which I understand is made from the residue of an aluminum smelting process. It undoubtedly contains aluminum in some form. Results obtained have been very good until recently we began cleaning steel parts which are hurriedly polished and reach the plating department in very greasy condition. I use the solution as a still wash, agitate only by hand and have tried using soap in combination with the compound, but the labor required to properly clean the steel is as yet too great. Will you kindly tell me how to improve the results

from this solution, or suggest suitable cleaner if you consider this one useless?

Answer—We would not criticize the worth of the cleaning compound you refer to, but would simply advise the use of ¼ pound of sodium carbonate per gallon of cleaning solution, free from soap additions. If action obtained is not what you require, increase the amount of sodium carbonate to 8 ozs. per gal., and add from ½ to ¾ ozs. of common rosin. Soap will form in the solution and the cost should be less than when using soap itself. The writer has always obtained sufficient action by use of the sodium carbonate only. We would suggest that you test your cleaning solution for strength, possibly the solution is too dense; if so, the results would be very inferior to results obtained from a solution below normal concentration. Any cleaning solution used in ordinary electro-plating processes may easily be maintained too dense.

Question—During the past few days we had an experience quite new to us in respect to electro coppering, using a cyanide solution. The product which we copper is constructed of steel wire, the wire is purchased copperized, or coated with a film of copper by immersion in copper sulphate solution. This copper wash is not protective and the wire becomes badly oxidized or rusty when stored in a damp place for short time. We have cleaned the wire by mechanical treatment and obtain a surface which appears smooth and free from injurious matter when inspected with naked eye. When swilled in cleaning solution and dipped preliminary to copper-plating the surface acquires a dark brownish color which cannot be removed by scouring with pumice. The wire coppers very slowly and the copper deposit is usually quite dark at center of the clusters, in which form they are plated. Color of deposit will not become pink during twenty-minute period of copper-plating and the subsequent deposit of nickel easily flakes off the portion of wire where dark copper deposit forms. Our cyanide copper solution is the ordinary solution generally employed and registers 12 degrees on hydrometer. Anodes are usually dark but not black. Can you suggest a possible remedy for the trouble as we have described it?

Answer—We would advise close inspection of wire with strong magnifying glass and believe you will find that you have not thoroughly removed the surface skin of the wire. There is much wire on the market which is very cheaply made and which requires more care in preliminary treatment than was the case with wire a few years ago. Make your mechanical treatment more effective either by increasing time of treatment or improving method, then eliminate the dips which have a tendency to discolor the wire after first treatment. It should be very easy to clean the wire sufficiently well to receive cyanide copper deposit, without resorting to use of very strong immersion solution. Your copper is too dense to produce quick reliable deposits on wire plated in bunches or clusters, irrespective of the strength of current used. Remove at least 50 per cent. of the solution to some clean barrel or tank and dilute the remaining 50 per cent. with clean soft water, add sufficient sodium cyanide solution to the diluted copper solution to insure freedom from anode scum or scale during rest periods of one hour or more. Use about five volts tension and as high current density as possible. Five minutes should produce good deposit.

Question—Please inform me of best way of disposing of the nickel dust and nickel chip scrap that accumulates from nickel anodes. I have several hundred pounds on hand.

Answer—There is no practical method of using the scrap in the plating room, neither is it advisable to attempt to use it in the manufacture of nickel anodes. Therefore, the demand for the material is very limited. It may be possible to find a scrap metal dealer who will allow you a nominal price for it, but you will probably be compelled to use some measure of persuasion with him as there is very little profit in handling scrap metal of this nature. Do not be persuaded by unscrupulous foundrymen into any scheme whereby low grade anodes might be cast from the scrap combined with unknown quantity of nickel shot, as you will surely pay heavily for your experience.

Question—We are lead plating steel cylinders used in certain fire extinguishers and have experienced some trouble from rust. The lead does not appear to protect the steel as we expected. Would it improve results if we deposit a coating of zinc over the lead?

Answer—In preparing the cylinders for plating avoid the use of acid pickle if possible; sand blasting is preferable for obvious reasons. If acid must be employed, use either nitre cake or phosphorus acid. Lead coatings are not regarded as being good protection for steel, particularly if the article is liable to receive a scratch or dent during construction after separate parts are plated, or lead coatings accelerate corrosion under certain conditions. If lead is absolutely necessary we would suggest that you plate the cylinders as follows: Plate in hot cyanide copper for 10 or 15 minutes, less will do if bath works efficiently. Zinc plates in cyanide zinc solution for 15 minutes to 30 minutes, then transfer to lead bath and deposit usual amount of lead. Copper deposit is used to assist in determining perfect covering of zinc. Zinc is the really effective protective metal. Experience has proven that zinc coatings over lead coating are practically useless, while lead coatings over zinc coatings will withstand very severe salt spray tests. Bituminous paint over zinc coatings has given excellent wear and proven superior to metal coatings in many cases where friction was absent. We could not recommend the latter method for your purpose, however. Some of the most successful platers claim lead from acid bath is best. A neutral or alkaline strike is used first.

CLASSIFIED ADVERTISEMENT SECTION

TWO CENTS A WORD, including the "Canadian Foundryman" box numbers; minimum charge is $1.00 per insertion, for 50 words or less, set in 6 point type. Each figure counts as a word. Display ads., or ads. set in border, are at the card rates.

SITUATIONS WANTED

FIRST-CLASS MOLDER WANTS POSITION as foreman or assistant; have necessary ability and enthusiasm to make good. Expert on latest methods for economical production. Open shop preferred. Canadian and United States references. Distance no objection. Salary a secondary consideration. All correspondence strictly confidential. Address inquiries Box 2512, Canadian Foundryman. (c9f)

FOUNDRY FOREMAN REQUIRES POSITION, 15 years' practical experience. Marine general jobbing or machine work. Have a good general knowledge of moulding machines and cupola practice. Apply Box 5521, Canadian Foundryman.

PUT YOUR MATERIAL ON A SHANTZ TRUCK while moving through the shop. It will pay you. Factory trucks of all kinds and special sizes and styles to order promptly. Jobbing castings. P. E. Shantz. Preston.

WANTED—POSITION AS FOUNDRY SUPERintendent, qualified with practical experience, engineer's training and business ability. Box 3521, Canadian Foundryman. (c6f)

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CASTINGS IN BRASS, BRONZE, ALUMINUM for Electrical Engineering and general trade. Specialty—Aluminum Match Plates Castings. 20 years experience, foundry practice, and first-class work guaranteed. The Napier Foundry, Box 248, Walkerton, Ont. (c7f)

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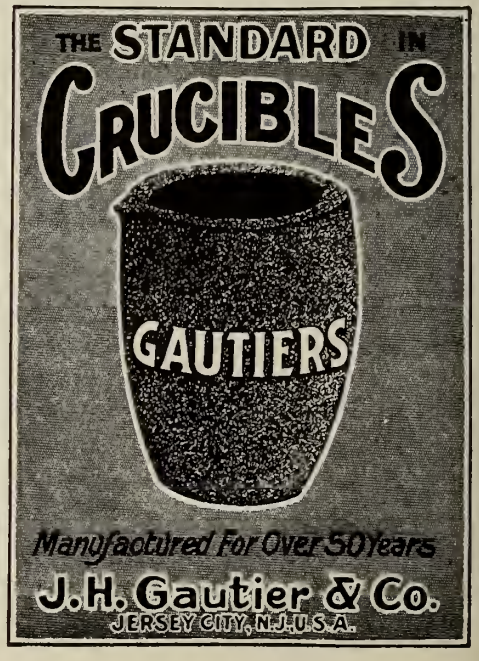

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The celebrated Morgan English Crucibles, carried in all sizes.

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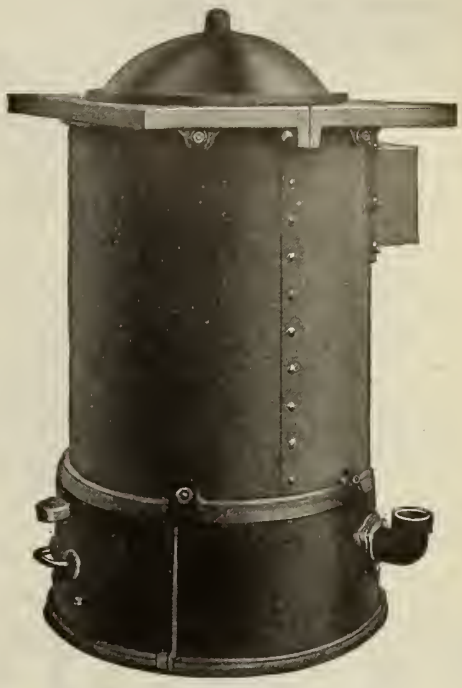

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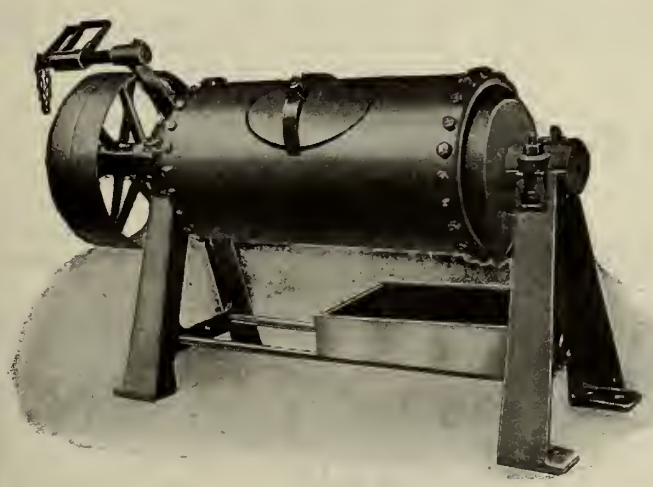

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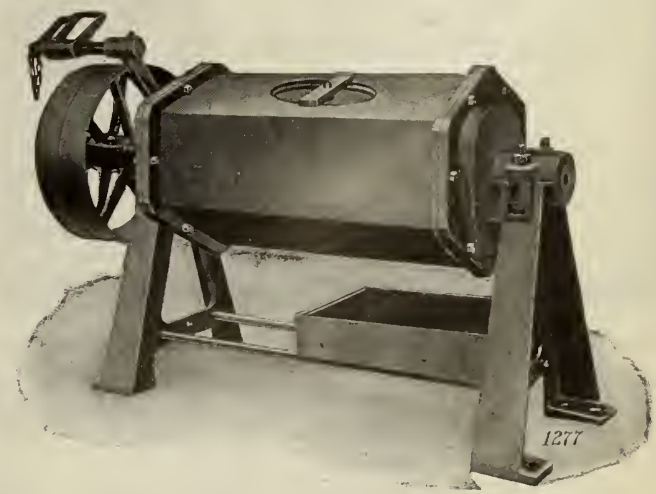

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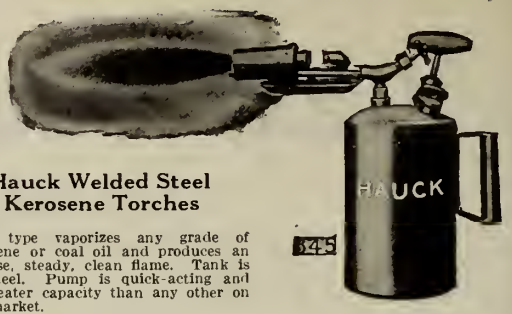

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HARDLY a week passes that "Canadian Foundryman" does not receive copies of this paper returned by the postal authorities because of the change in firm names or the address of some whose names are on the mailing list. Sometimes complaints reach us of the non-delivery of mail matter. It is not till the receipt of such complaints or the return of the paper, as the case may be, that we obtain any knowledge of the changes or removals of persons or firms. The adoption of the co-operative spirit on your part by notifying changes would make things a good deal more pleasant for both parties. The MacLean Publishing Co. want their mailing list to be in such shape that they will be able to render the perfect service to their subscribers. There is a lot of valuable trade matter mailed by this company and if you don't receive it—well, the fault is entirely yours.

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Any style or shape
Quality Guaranteed

Why import your anodes when you can get guaranteed quality, quicker delivery, and can save duty and eliminate the annoyance of clearing at the customs by buying from us?

May we send you descriptive pamphlet and full particulars?

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In Brass Bronze Copper Nickel Tin & Zinc

Buffalo Brand VENT WAX

Easiest and Best Way to Vent Any Core

Buy It in Canada at

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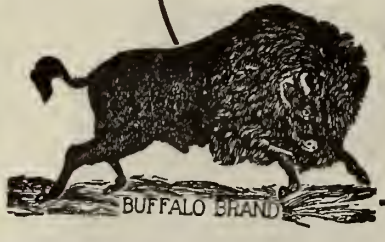

Give it a trial

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

No matter how good a mechanic a man may be, he will still find valuable pointers in mechanical journals, will rely on them for his information on new equipment. CANADIAN FOUNDRYMAN is one of the best magazines of this kind, and it is the only foundry magazine in Canada. It circulates in practically every Canadian foundry and is indispensable to the man who would keep abreast of progress. It is an educative journal that has given its wide circle of readers a thorough understanding of foundry operations and an interest in the betterment of foundry conditions. Finally, the advertising pages are always carefully scanned for the valuable information they contain. As a publicity medium, CANADIAN FOUNDRYMAN cannot be equalled.

What are Your

SAND

Requirements?

We are supplying the needs of many of Canada's largest foundries. They reorder from us because we give them satisfaction—in quality, price and prompt deliveries.

3 Grades Moulding Sand

3 Grades Pipe Sand

3 Grades Core Sand

A Partial List of our Satisfied Users

American Radiator Co., Buffalo.
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(The above two ordered 150 and 100 cars respectively in 1920)
Erie City Iron Works, Erie, Pa.
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Grand Trunk Railway System, Montreal.
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Any Kind of Building Sand

We have a grade of sand for every purpose. State your requirements and we will gladly send samples. Distance is no object. Write to

Benson & Patterson

STAMFORD, ONT.

Patented Feb. 15, 1921 U.S.A.
Patent applied for in Canada

BUFFALO

Corrugated Gaggers

stay where they are put—the corrugated sides of the leg and toe grip the sand firmly and the round bottom insures secure anchoring. They are strong—the truss effect at the bend gives ample strength to the toe. They have all the advantages of solid gaggers yet *weigh less and cost less.* Conveniently packed, 200 to the box, makes handling and storing easy.

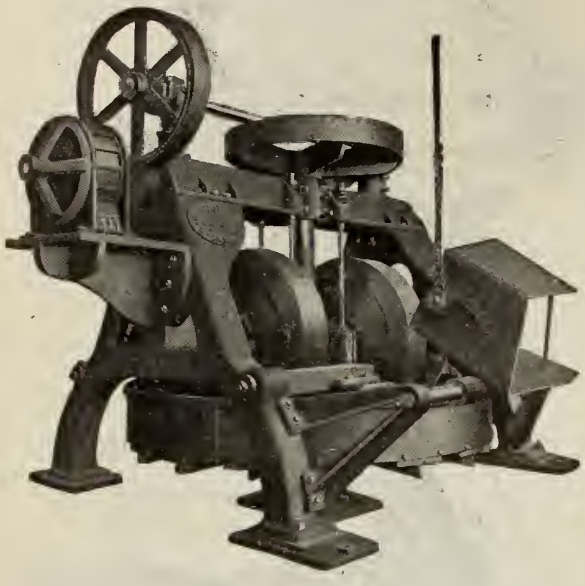
Write your supply house or us direct for a sample

UNITED COMPOUND CO.

228 ELK STREET

BUFFALO, N. Y. U.S.A.

Frost
Wet Pan Sand Mill
for Steel Foundries



The Frost Mfg. Co.
112 W. Adams St.
CHICAGO

FOUNDRY PRODUCTION

WE DESIGN
Industrial Plants
Power Plants
Foundries
Machine Shops
Bridges
Hospitals
Banks
Public Buildings

AND MAKE
Reports
Estimates
Appraisals

Adequate foundry facilities, ample floor space, proper ventilation and lighting are features in foundry design, which, in connection with operating efficiency, will insure maximum production.

It will pay you to consult us on your foundry problems.

The Osborn Engineering Co.
CIVIL, MECHANICAL, ARCHITECTURAL ENGINEERS
2848 PROSPECT AVE. CLEVELAND, O.

IF YOUR MESSAGE TO THE TRADE

is advertised in Hardware and Metal it goes by paid subscription to every wholesale hardware buyer in Canada and over 90% of the retailers. An examination of hardware-store displays, or inquiries in the stores, will convince you that these men invariably prefer to buy goods made familiar in the advertising pages of Canada's only weekly hardware trade paper.

HARDWARE and METAL

"Canada's National Hardware Weekly"

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Published every Saturday since 1888. The only weekly hardware paper in Canada and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations.

PRESSURE SEATED AIR VALVES
"The Valve That Never Leaks"

Style S.L.

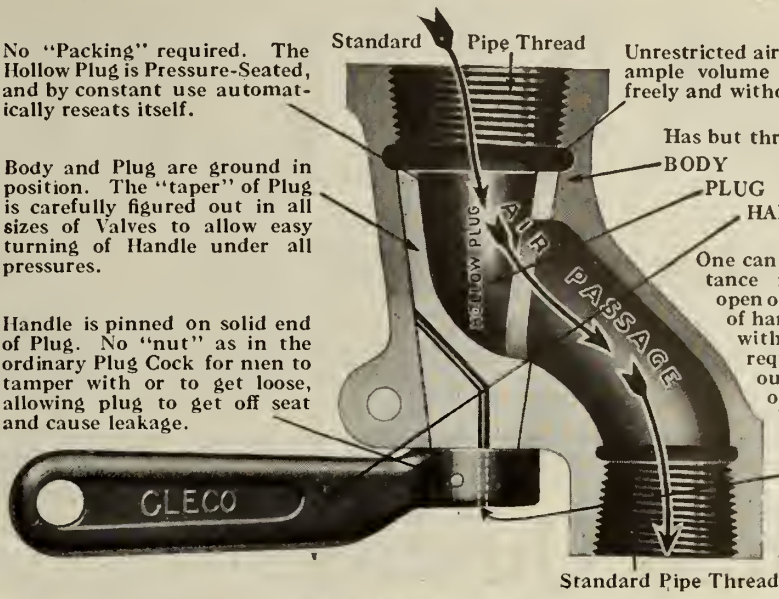
Style L.W.

Style F.W.

No "Packing" required. The Hollow Plug is Pressure-Seated, and by constant use automatically reseats itself.

Body and Plug are ground in position. The "taper" of Plug is carefully figured out in all sizes of Valves to allow easy turning of Handle under all pressures.

Handle is pinned on solid end of Plug. No "nut" as in the ordinary Plug Cock for men to tamper with or to get loose, allowing plug to get off seat and cause leakage.



Unrestricted air passage allows ample volume of air to pass freely and without friction

Has but three parts:—
BODY
PLUG
HANDLE

One can "See" from a distance if Cleco Valve is open or closed by position of handle. Other makes with "Wheel" control require a visit to find out if Valve is fully open or partially so. Why waste time?

Waste Port which permits the air in Hose to escape to atmosphere when Valve is closed.

"The Valve That Improves With Use — Requires No Attention After Installation"

Style R.A.

We Manufacture

The Well Known Bowes Air Hose Coupling

In Stock—Riveting and Chipping Hammers, Air Drills, Air Grinders, Sand Rammers, Holder-Ons, Etc. *Bulletins 46, 48 and 49 Mailed on request.*

Style A

Cleveland Pneumatic Tool Co. of Canada, Ltd.

TORONTO, ONT. MONTREAL, QUE.

SLY SAND BLAST EQUIPMENT "UP - TO - DATE"

No. 4 Sandblast Barrel

Tilted Type - - - Five Sizes
SANDBLAST BARRELS

Ideally adapted for cleaning small work and extensively used for forgings, stampings, grey iron, brass, bronze and aluminum castings. Most intricate work can be cleaned successfully, as owing to the tilted position of the barrel, revolving at an incline, in connection with the conical bottom plate, the work is turned at such various angles that all parts and surfaces are exposed to the blast.

These mills can be had in five separate sizes, ranging from 14″ to 36″ in diameter, and from 16″ to 36″ in depth.

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Birmingham
Paris, France

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Detroit
St. Louis
Los Angeles

Representatives for Quebec and Maritime Provinces:
Williams & Wilson Limited, Montreal, Que.

The SLY Line of up-to-date Foundry Equipment

- Steel Tumbling Mills
- Iron Cinder Mills
- Brass Cinder Mills
- Resin Mills
- Sand Blast Mills
- Sand Blast Mills—Tilted
- Exhaust Fans
- Sand Blast Rooms and Blast Cabinet
- Sand Blast Rotary Tables
- Dust Arresters
- Cupolas
- Core Ovens
- Core Sand Reclaimers

HAMILTON

Foundry Facings and Supplies

MADE IN CANADA

High in Quality Low in Price

It is obvious that our thirty years' experience as Canadian manufacturers has placed us in an excellent position to produce high grade products at low prices.

Climax Silver Lead

We have many customers who tell us that this facing is the equal, if not the superior, of those extremely high-priced leads which are being offered the foundryman daily.

Climax Silver Lead is for medium and lighter grades of castings. It will brush on the mold. It is sold at a moderate price, and invariably proves its worth at the first trial.

Imperial Plumbago

Having been in constant use for thirty years among foundrymen making stove plate and ornamental work, it has naturally become a household word. If you are not already acquainted with its merit, give it a trial.

Canadians and Canadian Buying

Not everything required by Canadians can be bought in Canada. But, products "Made in Canada" are entitled to preference—providing, of course, that the quality and prices are the equal of the imported lines.

Of course, we do not pretend to believe that you should buy Canadian products if you can get better value for your money elsewhere. We do claim, however, that every true Canadian should **make sure** that the merchandise which he requires **cannot be secured in Canada at a reasonable price** before sending his orders out of the country.

As the prosperity of Canada as a whole, and of your business in particular, depends largely upon the money in active circulation in the country, it is to the advantage of every man in Canada to adopt the slogan—

"Canadian money, Canadian made, should stay in Canada for Canadian trade."

—and live up to it!

The Hamilton Facing Mill Co., Limited

Head Office and Mills

Hamilton, Ontario, Canada

TRUSCON STEEL CO. TRUSCON PRESSED STEEL

STRENGTH

Without Excess Weight

YOUR moulders are expending their strength in lifting tons of unnecessary weight if they are doing their moulding with old-fashioned flasks. You pay for this wasted energy. The use of Truscon Flasks eliminates this waste and permits more and better work.

Truscon Flasks are designed to have ample strength without excess weight. The thickness of the shell varies from ⅛″ to ¼″, depending upon the size of the flask, the weight of the sections and the kind of metal to be poured.

Users of Truscon Flasks find that they conserve the energy of their workmen and secure bigger production—the design of Truscon Flasks permits the use of less sand.

Truscon Flasks are built to stand strenuous duty. They are formed of special Truscon Alloy Steel Plates. The deep ribs and broad flanges give to the steel shell exceptional strength and rigidity. **They possess other features of construction which should prove interesting to you—write for full details.**

TRUSSED CONCRETE STEEL CO. OF CANADA, LIMITED

WALKERVILLE, ONTARIO, CANADA

TRUSCON FOUNDRY FLASKS

DIXON CRUCIBLES

From graphite mine to finished crucible, the entire process is in the hands of Dixon operatives, many of whom have made the manufacture of Dixon Crucibles their life-work.

Each crucible that bears the name DIXON carries the endorsement of an organization which has been through every stage of crucible evolution.

Write for Booklet No. 27A.

Joseph Dixon Crucible Co.
Jersey City, N. J.
U.S.A.
Established 1827

Canadian Agent:
Canadian Asbestos Co.
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CRUCIBLE MELTING FURNACE

YEARS of service cannot diminish the high melting efficiency of a Hausfeld. Correctly designed and built to give faster heats in a given time, they lower cost wherever used. Complete unit or gas only. Send for complete description.

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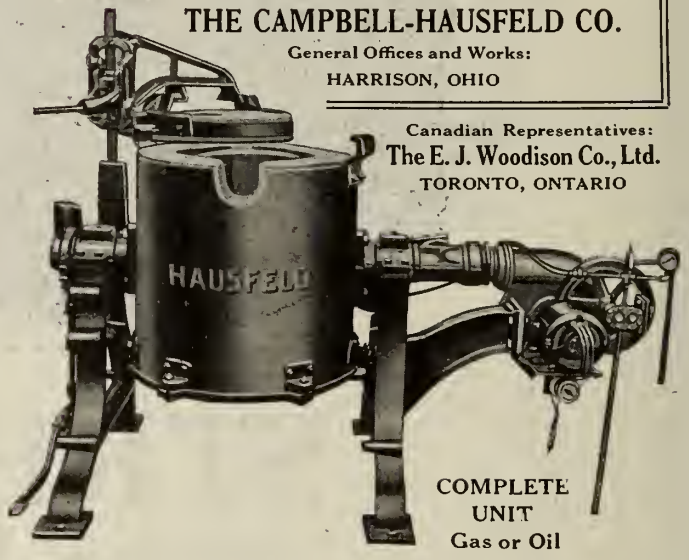

COMPLETE UNIT
Gas or Oil

Tumbling Barrels

Tilting and Burnishing Barrels

CANADIAN MADE

SLATER & BARNARD
LIMITED
Hamilton, Ontario

WHITEHEAD'S KAOLIN

Most reliable material for lining and patching Cupolas, Furnaces, Ladles, etc., saves time, labor and firebrick.

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If what you want is not listed here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

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Woodison, E. J. C., Toronto, Ont.

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Holden Co., Ltd., The, Montreal.

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Holden Co., Ltd., The, Montreal.

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Holden Co., Ltd., The, Montreal.

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Venango Sand Co., Franklin, Pa.

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Pangborn Corporation, Hagerstown, Md., U.S.A

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Stevens, Frederic B., Detroit, Mic
Woodison, E. J. Co., Toronto, On.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Skinner Bros. Mfg. Co., St. Louis, Mo.
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Woodison, E. J., Co., Toronto, Ont.

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Reynolds & Co., Toronto.

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Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
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Pettinos, George F., Philadelphia, Pa.

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Ministry of Munitions. London, England.

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Oliver Machinery Co., Grand Rapids, Mich.

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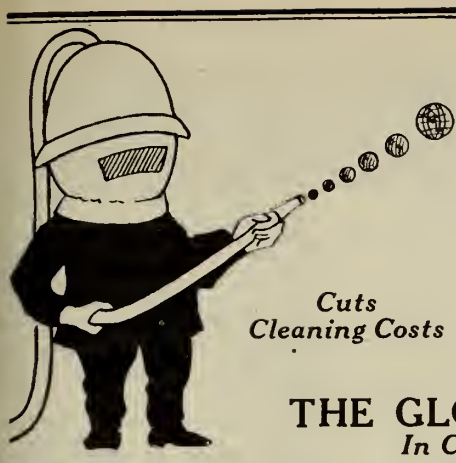

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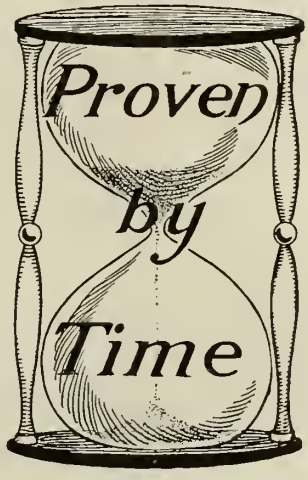

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Herman Pneumatic Tool Co., Pittsburgh, Pa
Tabor Mfg. Co., Philadelphia.
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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Mussens, Ltd., Montreal, Que.
Sterling Wheelbarrow Co., Milwaukee.
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Holden Co., Ltd., The, Montreal.

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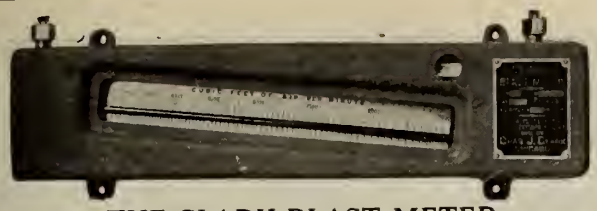

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indicates the number of cubic feet of air or gas passing per minute.

The Meter is furnished in any capacity desired, each one built to order and guaranteed in every respect. Several hundred are in use in smelters, steel works, coke plants, etc.

Booklet cheerfully sent—write for it.

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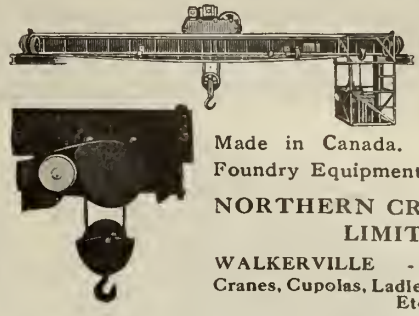

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WALKERVILLE - - ONTARIO
Cranes, Cupolas, Ladles, Hoists, Tumblers Etc.

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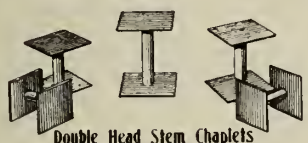

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Phone Adelaide 5439

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SCIENTIFIC METALLIC BLASTING ABRASIVE

Trade Mark

Adopt metallic abrasive instead of sand. Angular Grit will reduce your costs — one hundred pounds of grit will outlast five tons of sand. It cleans faster, requires less handling and less storage space, and reduces dust 80%. Write for samples.

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PITTSBURGH, Pa., U.S.A., Established 1888
Canadian Representatives: WILLIAMS & WILSON, Ltd., Montreal, Canada

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PANGBORN CORPORATION ALL WAYS SERVICE AND ALWAYS HAGERSTOWN, MD
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Sand-Blast cleaned are worth more.

They machine faster with less tool expense and paint, plate or galvanize with a better and more lasting finish.

With the right equipment Sand-Blasting cleans them cheaper. "Pangborn" Sand-Blast Equipment meets every need and pocket-book.

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of Every Description
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LIGHT MANUFACTURING

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PATTERNS
in Wood and Metal

The Downer Pattern Works

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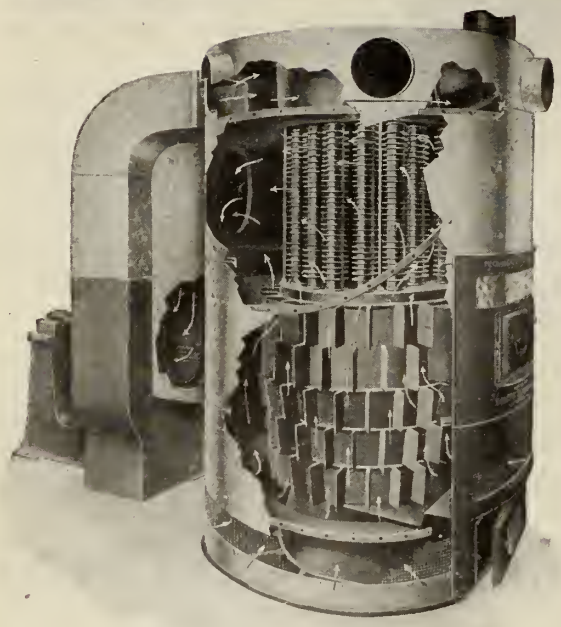
Telephone Adel. 6173

OUR WORK IS GOOD AND OUR PRICES RIGHT
HAVE US MAKE YOUR PATTERNS

TORONTO

YOU, Too, Can Make This Startling Coal Saving—



The Multivane Fan forces heat near the floor.

In hundreds of buildings, both large and small, from one-half to four-fifths of the coal used for heating purposes is a dead loss. Under ordinary heating systems, the heat quickly rises to the ceiling or skylight—and is wasted. How to overcome this enormous loss is answered with

The Mechanical Hot Blast Heater

Cuts Coal Bills in Two

This heater, employing simple, but radically different principles from the old line of heaters, forces warm, moist air horizontally, near the floor level, in the direction needed. A multivane fan distributes the heat direct to the proper spot. This results in a tremendous saving in coal—a saving that is especially important in this period of sky-high coal prices. Tests made at the Armour Institute of Technology prove conclusively that the efficiency of the Mechanical Hot Blast Heater is about double that of any other type of heating apparatus. Will burn economically bituminous or anthracite coal, coke, oil or gas.

It will pay you to write for the complete facts.

858 Dupont St. Toronto, Ont.

THE E. J. WOODISON CO. LIMITED

261 Wellington St. W. Montreal, Que.

Manufacturers in Canada of the Robt. Gordon Mechanical Hot Blast Heater

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"The Wise Buyer Buys Stevens Supplies"

The New Fashionof Economy

We hear much and read much these latter days about "conservation" of food, money, et cetera, and sometimes applied by my lady gay to economy in purchases of ostrich feathers and "sich," but a real commendable adaptation by the Foundryman may be had when buying Plumbago, otherwise known as "Ceylon Lead."

STEVENS NO. 510 PLUMBAGO

gives you old fashioned, pure-quill Ceylon quality, and the best possible service, and "conservation" is exercised in the price.

There is "conservation" all around, in Ceylon quality while it lasts, and in money which you will need for taxes, for the tax collector is abroad in the land.

For your Buffing and Polishing Department, it is worth while to know about my Buffing Compositions—all manufactured right here, where standard of quality is maintained. When you need the best you should know where to buy. Need is like a boat without oar or motor —drifting; don't drift.

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Cupola Blocks, Fire Brick and Clay.

Corner of Third and Larned Streets
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Canadian Branch: **WINDSOR, ONT.**

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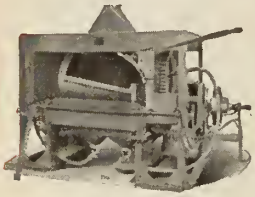
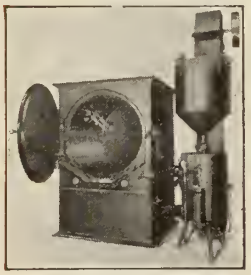
Type EH Cabinet

AMERICAN
Humane Type Rotary



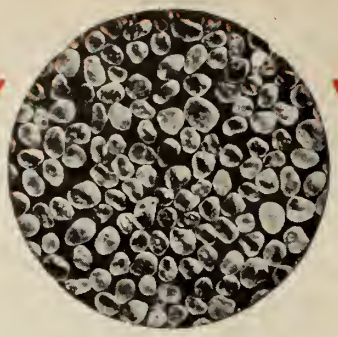
SLY
No. 30/40
Inclined Barrel
Mill.



MOTT
Type P.E.S. Single
Barrel

PHOENIX
No. 2 Open Sand Blast

LEIMAN
Hand Cabinet



FLINT SHOT

is Commended by the Makers of Every Type of Sand Blast Equipment

Whether pressure be high or low.

Whether metal be hard or soft.

Whether in Room, Table, Barrel or Cabinet—

FLINT SHOT increases output and reduces cost **per ton** of metal cleaned—compared with **any** other abrasive, be its price the highest or the lowest.

"Flint-Shotting" has replaced pickling and other antebellum methods of cleaning in all up-to-date metal-working industries.

Send for our interesting Book—"Little Journies of the Flint Shot Man."

United States Silica Company

Sole Producers of Flint Shot

1961 People's Gas Building
CHICAGO

FLINT SHOT
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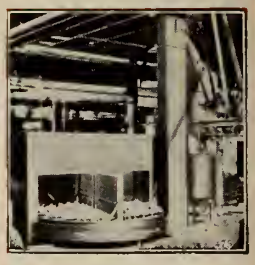
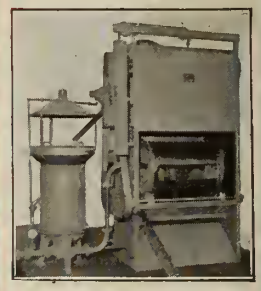


MACLEOD
Humane Table

NEW HAVEN
Model A. Barrel



HOEVEL
Revolving Barrel

TILGHMAN
No. 6 Single Hose
Type

PAXSON
Tank Type With
Water Trap

Get in touch with these Sources of Information

Send for catalogs and literature of the following manufacturers of sand blast equipment; telling them the character of products you turn out and getting their advice as to the equipment best suited to your needs.

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Leiman Brothers—New York, N.Y.
Mott Sand Blast Co.—Brooklyn, N.Y.
Macleod Company—Cincinnati, Ohio.
New Haven Sand Blast Co.—New Haven, Conn.
J. W. Paxson Co.—Philadelphia, Pa.
Pangborn Corporation—Hagerstown, Pa.
Phoenix Machine Co.—New York, N.Y.
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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

Vol. XII Publication Office, Toronto, August, 1921 No. 8

MOULDING SAND

Government Tested

Brockville Sands are recommended by the Mines Branch of the Dominion Government who place them on actual foundry tests with Albany and other sands. For analysis and tests refer to Bulletin No. 21 1917.

BROCKVILLE Sands are **Government Tested** Sands — scientifically examined and highly recommended for the use of Canadian Foundrymen. In other words the Government "stands back of" Brockville Sands.

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Since 1912 Brockville Sands have been the popular choice of leading Canadian foundries. If you are interested in better sands let us have your enquiries.

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LIMITED

BROCKVILLE, ONT.

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This is why Kawin Foundry Service has proved of such inestimable value to Canadian and American Foundrymen.

The Service consists of capable, highly trained men, each of whom has learned his own particular branch of foundry practice —both practical and theoretical—from the bottom to the top.

Because experience has proved just what Kawin Service can accomplish in a foundry, we are able to **guarantee that our service will save you at least 100% over and above its cost!**

Write for full particulars to-day.

Consider your foundry as a ship— and Kawin as the pilot.

Charles C. Kawin Company

307 Kent Building, Toronto

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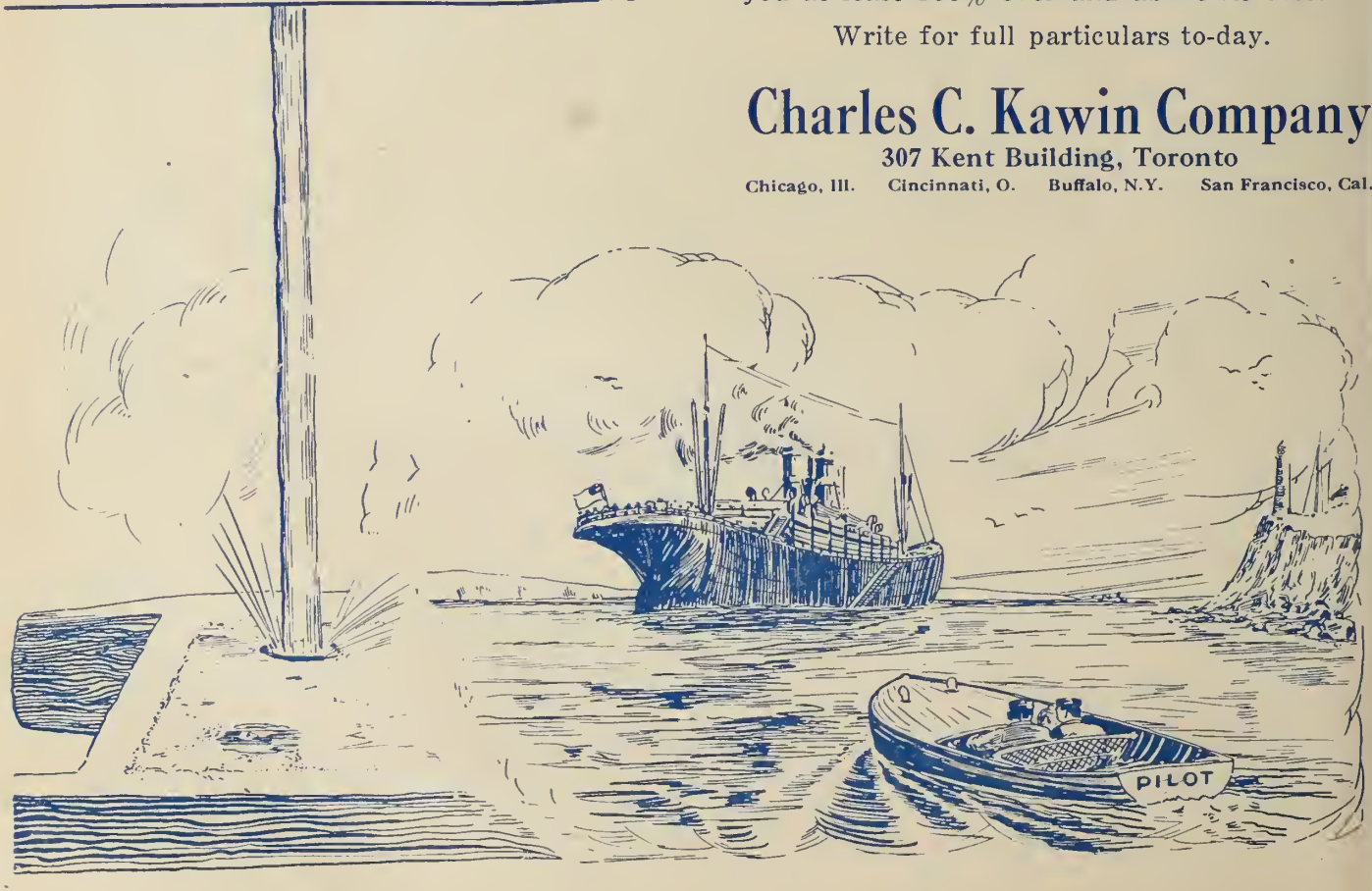
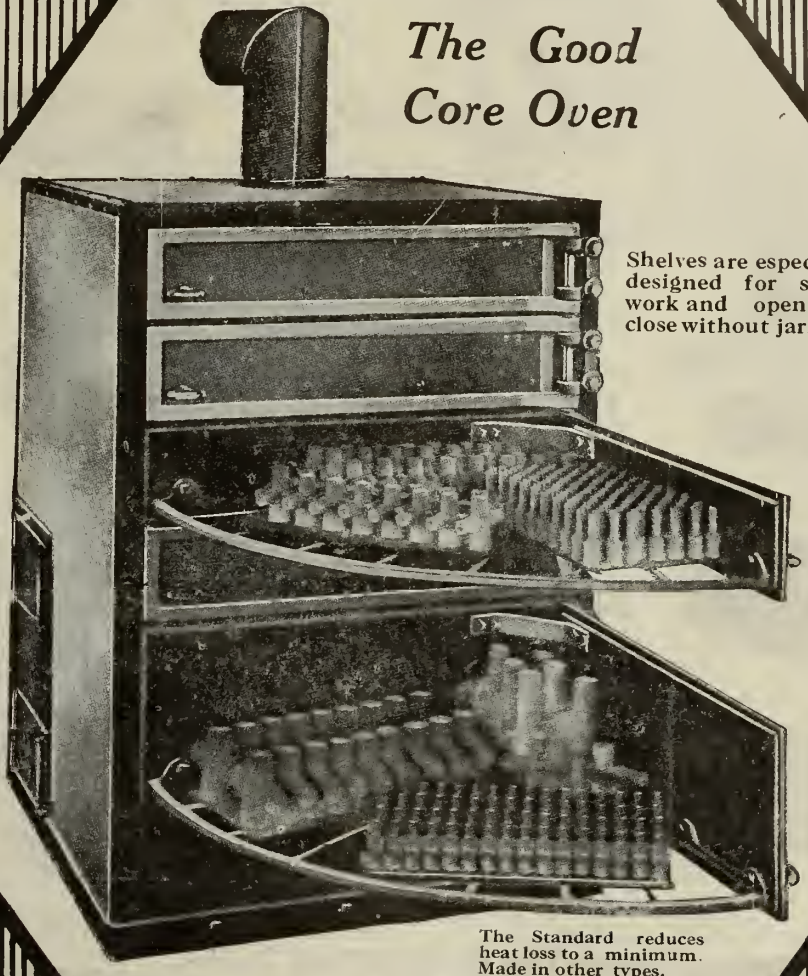


Get
Yourself
A

STANDARD

The Good Core Oven



Shelves are especially designed for small work and open or close without jarring.

Saves Time and Fuel

Heats by Gas, Coke or Coal
Without extra charge

The Standard reduces heat loss to a minimum. Made in other types.

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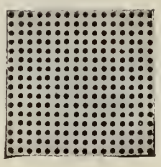
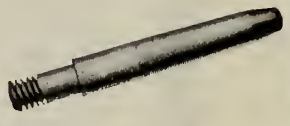
Company, Limited
Foundry Requisites, Fireclay Firebrick and Equipment
Toronto, Ontario
Branch at 261 Wellington St. W., Montreal, P. Q.

Sterling

Foundry Specialties
Are
Foundry Necessities





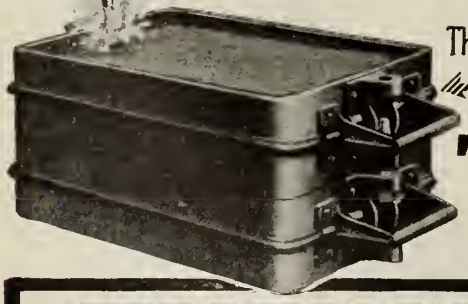
Losses

A skilled moulder making wedges or gate sticks —production retarded— dirt in the castings; wasteful effort—needless steps. These profit leaks can be turned into

Gains

Skilled labor properly applied — production speeded up—clean casting —efficient effort—steps that count. Let us help convert your losses into gains.

The Only Line Of Rolled Steel Flasks



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STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

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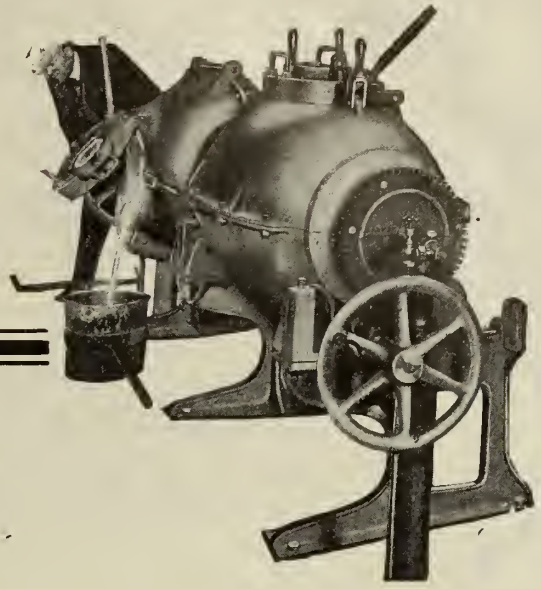
CHICAGO
ST LOUIS

CANADIAN AGENTS-MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VANCOUVER

"Monarch" Your Way To a More Profitable Foundry

You sometimes run across a man who excuses the backwardness of his foundry by saying "I cannot afford up to date equipment. I must be content with the old methods."

We hope he will read this advertisement.



Monarch Rockwell Double Chamber Melting Furnace.

Foundry Progress asks not "Can I afford this machine" but "Can I afford to lose the profits it will give me." The correct answer—the profitable answer—is found in the choice of Monarch Equipment.

Arundel Drop Front Core Oven.

THE "Monarch-Rockwell" Double Chamber Furnace is one of the greatest contributions to Foundry Efficiency and economy.

It reduces copper, brass, aluminum, iron, steel and like metals to molten condition in about one-half the time required by any other furnace.

As a time-saver the "Monarch-Rockwell" is 50 per cent. more economical than any other furnace burning oil or gas and air.

This furnace absolutely eliminates profitless waiting. One Chamber can be run off while exhaust heat brings the metal in the other to the melting point. There is no oxidizing.

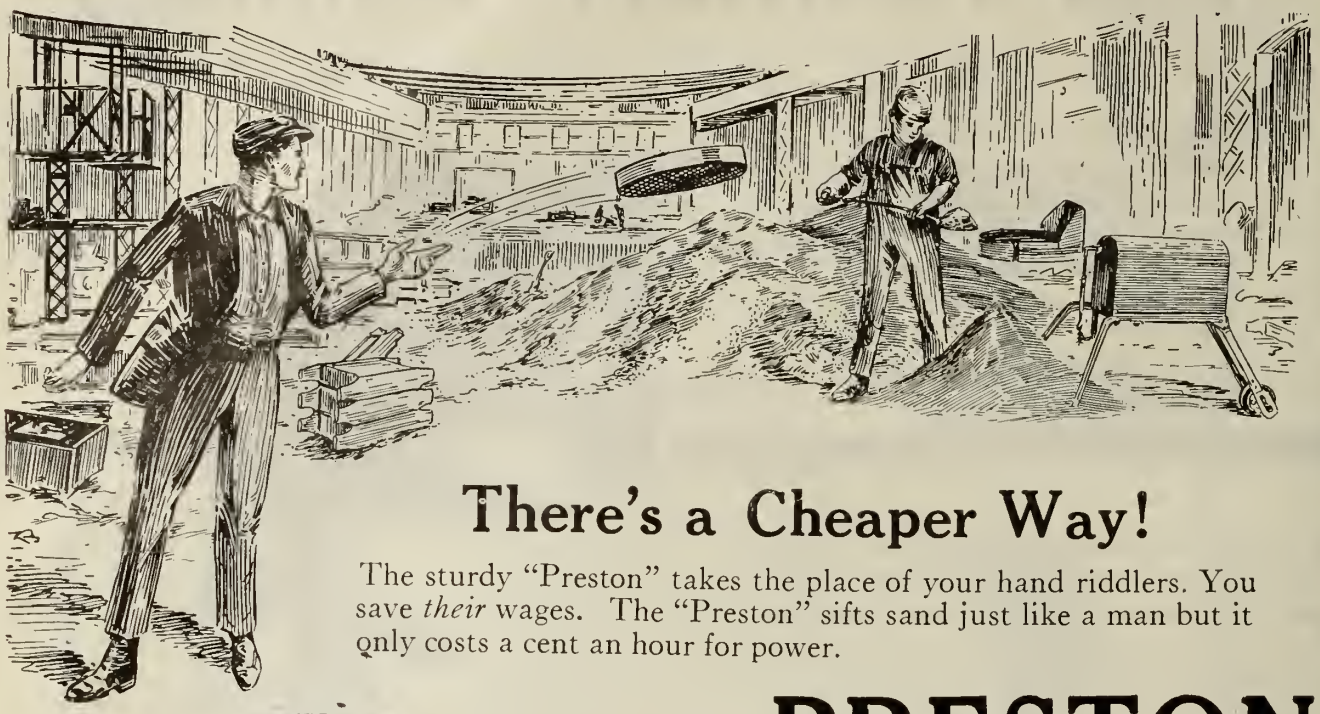
The "Arundel" Core Oven is built for all fuels and in all sizes. Asbestos insulated and yours for immediate delivery.

MONARCH FURNACES, without crucibles are SIMPLEX, DOUBLE CHAMBER, DUPLEX, REVERBATORY, etc. With crucibles, TILTING PIT, STATIONARY, CORE OVENS, SOFT METAL MELTING FURNACES, PUMPS, MOLD DRYERS, BLOWERS, LADLE HEATERS, OIL AND GAS BURNERS, MOTOR-DRIVEN OIL PUMPS, PRESSURE AND POSITIVE BLOWERS. We take the trouble off your hands and will submit information from a practical standpoint for the equipment of your foundry. Enquiries promptly answered.

The Monarch Engineering & Mfg. Company

1206 American Building, Baltimore, Md., U.S.A. **Shops: Curtis Bay**

Throw Away that Hand Riddle !



There's a Cheaper Way!

The sturdy "Preston" takes the place of your hand riddlers. You save *their* wages. The "Preston" sifts sand just like a man but it only costs a cent an hour for power.

PRESTON

Ball Bearing
Electric Sand

RIDDLE

Push the "Preston" anywhere. It is equipped with handles to make moving easier.

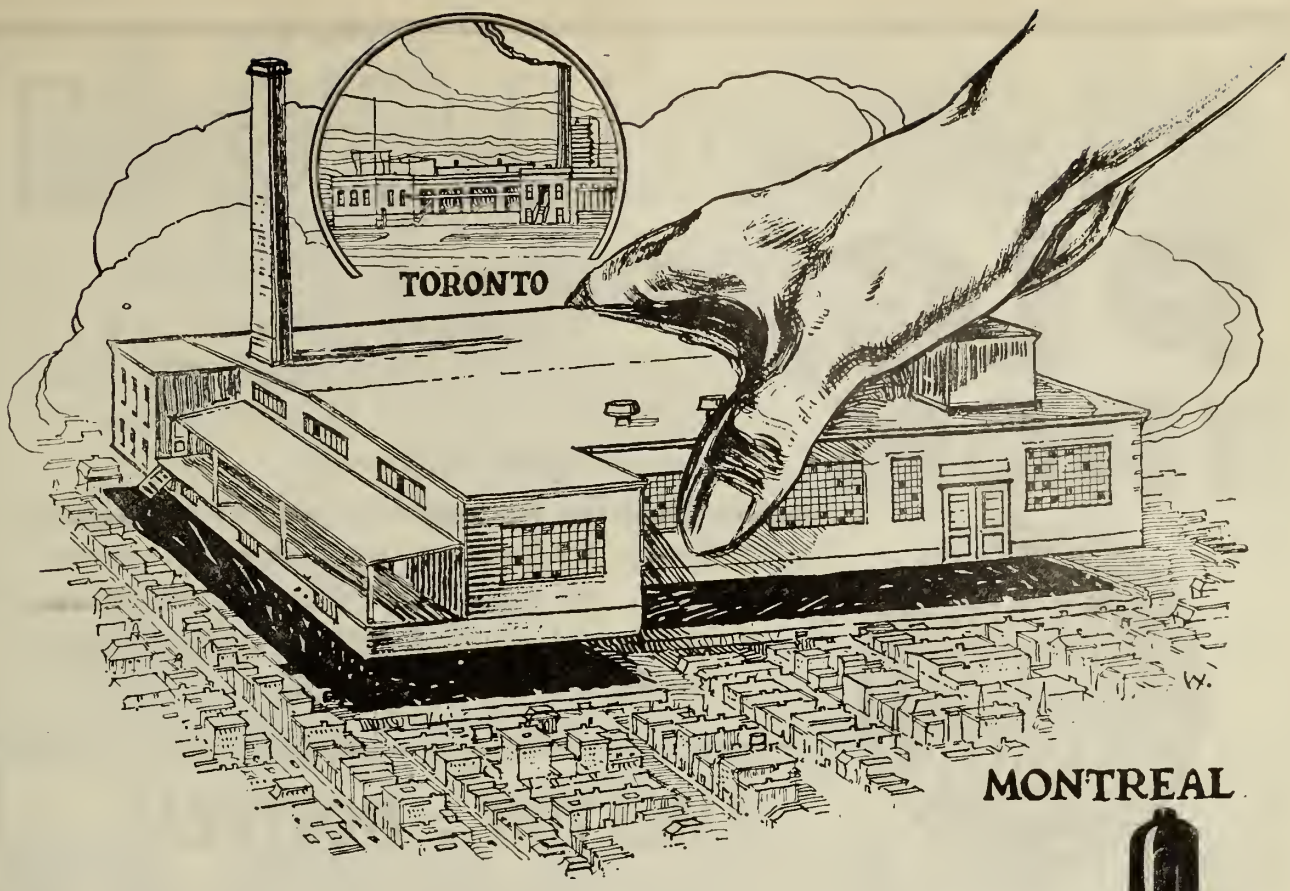
produces thoroughly sifted sand as fast as a man can shovel it in. It is always ready for work—never takes sick—can be quickly moved anywhere desired.

The get-ahead Foundries use the "Preston." Are you in that class? Write for details of our free trial offer.

Operates with a small 1-4 H.P. motor at negligible cost.

The Preston Woodworking Machinery Company, Limited.

PRESTON, ONTARIO, CANADA.



"Planting" Another Milestone

The Dominion Oxygen Company Limited announces the achievement of another milestone in its 1921 building program.

In July ground was broken in Montreal for a second large oxygen producing plant. Located at Magdalen, Lieber and Bourgeois Streets, this producing unit will have 10,000 square feet of floor space and will supplement the output of our Toronto plant by a 100 per cent. increase.

This expansion in manufacturing facilities will enable us to supply not only our regular patrons' steadily increasing demands for this highest purity product; but the needs of those who have wanted Dominion Oxygen and could not secure it.

And with the doubling of our producing machinery — employees and equipment—Dominion Oxygen consumers receive double insurance that our policy of filling all orders on the day of receipt will be rigidly maintained.

No matter where your location or what your requirements, an order dispatched to the nearest plant or distributing station — there are six of them—brings you the purest oxygen through the quickest service in the Dominion.

Dominion Oxygen Company, Limited

Hillcrest Park, Toronto

Hamilton, Merritton, Montreal, Welland, Windsor.

D20

"HAMILTON"

PIG IRON

THE STEEL COMPANY OF CANADA LIMITED

WE absolutely guarantee the quality of "HAMILTON" MACHINE CAST FOUNDRY AND MALLEABLE PIG IRON because we control its production from the mines to the finished product.

Iron Ore and Coal from our own mines; low sulphur By-Product Coke produced at our own plant. All pigs are machine cast and uniform in size, and, if desired, shipments can be made the day the order is received.

HAMILTON - MONTREAL

How to Test Advertising

THE man who doubts the power of advertising belongs in the same class with the man who refuses to believe that the world is round simply because he can't get off somewhere at a distance and see its roundness for himself.

The merchant who fears to attempt advertising because he figures it as an "expense" is blind to his own interests. I personally know several men who, because they once tried advertising to the extent of a cheaply printed hand-bill and didn't find it necessary next morning to call on the police to keep the crowds of eager buyers from swamping their store, loudly and solemnly aver that "advertising doesn't pay."

Advertising *does* pay.

The most successful merchants are the merchants who believe most thoroughly in advertising and who practice their belief.

But advertising, in order to pay, has got to be *intelligent* advertising.

The day of hashed-over superlatives — "best goods," "lowest prices," "best stock in town," "greatest bargains ever heard of," and so on—has passed.

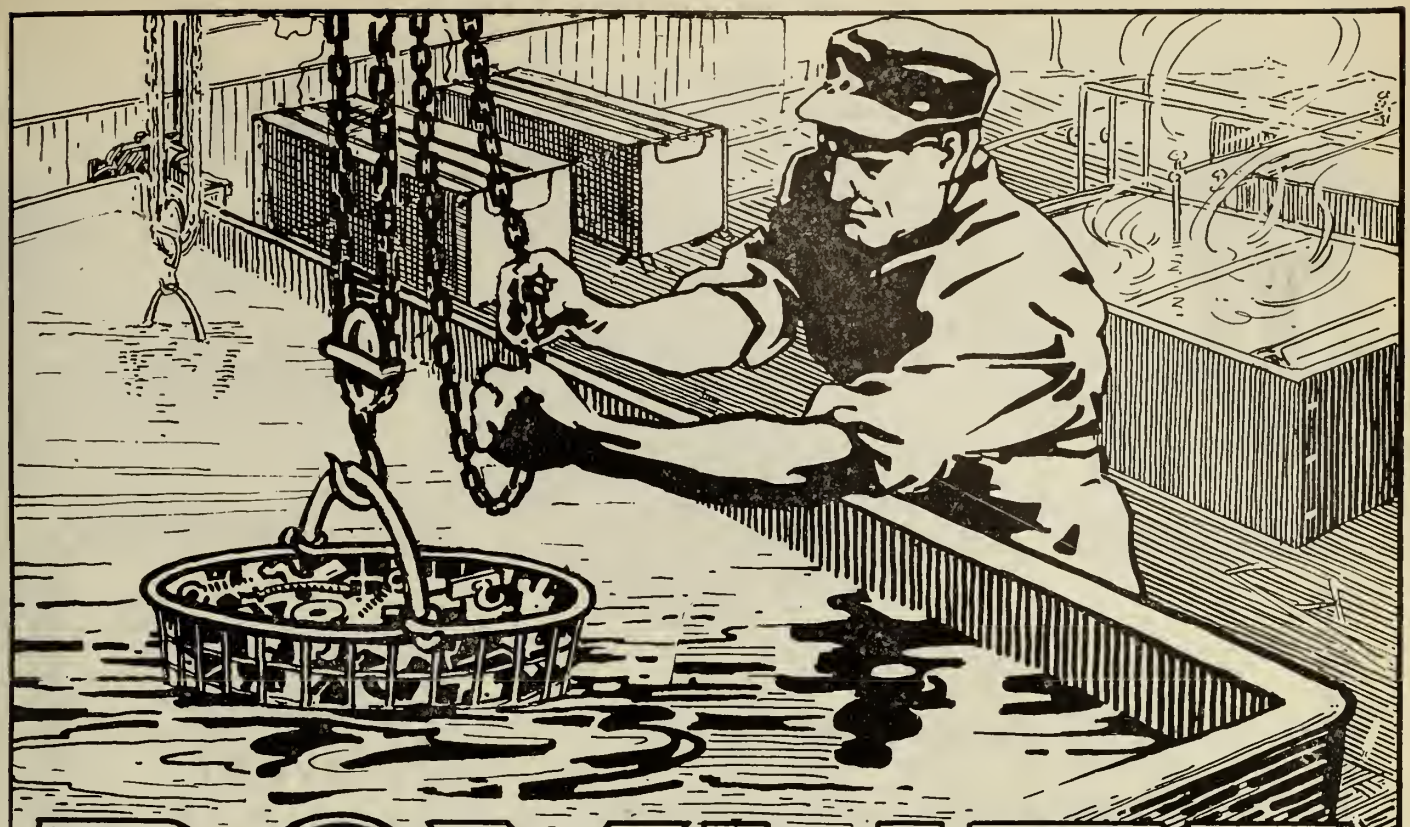
People have learned to distinguish the *truthful* advertiser from the blatant behind-the-times storekeeper who believes that, so long as *he* claims to have the best goods on earth, or under the earth, or within wireless distance of the earth, people will break their necks trying to get to his counters in the forefront of the crowd.

Put some *brains* into your advertising.

Don't let the office boy write your announcements in between his other duties.

Don't doubt the business-getting and business-building power of intelligent and informative publicity — and you will find that advertising *does* pay.

—*Jerome P. Fleishman.*



ROYLITE
CLEANER

A New Discovery!

ROYLITE Cleaner represents the very latest and most successful development in the process of chemically removing oil, grease, enamel, paint or any kind of dirt from metal in the quickest and most thorough manner.

Formerly most cleaning solutions consisted of caustic soda, potash or lye which saponified grease and acted like a soap. The alkali strength was quickly used up because the action caused a precipitate and heavy sediment formed at bottom of solution.

The new Roylite process emulsifies mineral oil and heavy greases which cannot be saponified, by lifting them from the work to top of solution, thereby avoiding the precipitate action, making it unnecessary to throw out solution but merely add small quantities to sustain its strength.

Guaranteed not to discolor or tarnish the brightest surface.

Our men will gladly give you demonstrations. Order a barrel to-day on approval.

Lasts longer — Works quicker — Costs less

Manufactured by

CANADIAN HANSON & VAN WINKLE CO. LTD.

TORONTO, ONTARIO

"MADE IN CANADA"

CLEANS ALL METALS

Cuts Cleaning Costs

The Effective Enduring Abrasive

It's the impact in blasting that does the work. **Sand** under impact crushes quickly and pulverizes to dust. It must be replaced by **new** sand frequently. Globe Chilled Shot can be used 250 to 275 times before it becomes ineffective. It reduces storage bins; eliminates sand driers; reduces labor costs.

Send for samples.

GLOBE

CHILLED SHOT

It gives you a better and quicker Blasting Job at a reduced cost.

THE GLOBE STEEL COMPANY, Mansfield, Ohio, U.S.A.

In Canada: Canadian Johns-Manville Company, Asbestos, P.Q.

GEO. F. PETTINOS
FOUNDRY SUPPLIES
PHILADELPHIA

SAND

DON'T EXPERIMENT—BUY OUR SAND. Years of successful application to their various uses have proven they are unexcelled in quality and uniformity. We have all grades—Strong Silica, Sharp Silica, Lumberton, Albany, White Washed Silica, Fire Sand, Blast Sand, and Genuine Millville Gravel.

Also

PLUMBAGO FOUNDRY FACINGS.

George F. Pettinos

Real Estate Trust Building - Philadelphia, Pa.

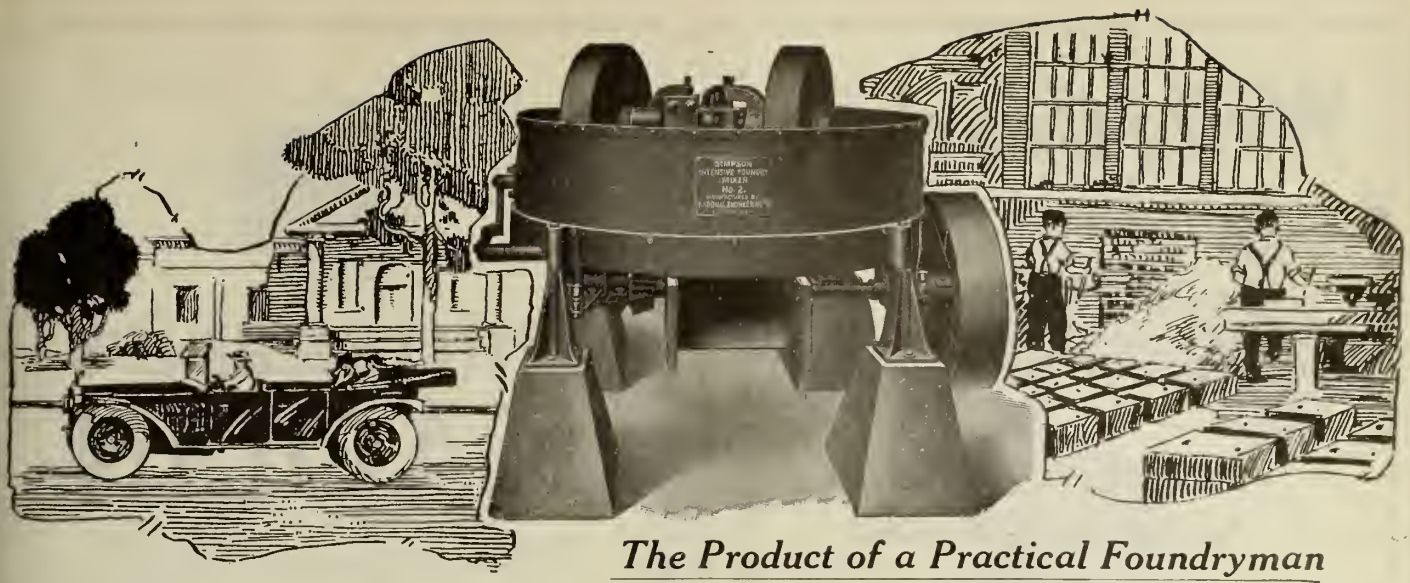
Send your orders and inquiries to our

Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

Used for Commercial Purposes for More Than Forty-four Years, **Scarfe's** Surface Satisfaction Paints and Varnishes

SCARFE COMPANY, LIMITED

BRANTFORD - - - ONTARIO



The Product of a Practical Foundryman

In Building the "Packard"—

It is more natural than singular that the equipment used be of the highest quality—equipment that reflects the same degree of craftsmanship which is built into this high grade car. Hence it is a noteworthy fact that all sands used for castings by the Packard Motor Company are mixed with

SIMPSON
INTENSIVE FOUNDRY MIXERS

This is in itself a high tribute to the efficiency and labour saving operation of the Simpson Mixer. But we are not confined alone to the Packard Company. Throughout the United States and Canada hundreds of Foundries are using Simpson Mixers—and getting better, cheaper mixtures in less time than by any other method.

We take pleasure in reproducing a copy of a letter received from the Packard Motor Car Company.

Here's the Letter

Detroit, Michigan,
Dec. 31, 1920

"We are using three of your Simpson Intensive Foundry Sand Mixers, all of which are giving the best of satisfaction. All core sands, facing and mulled sands that are used for making semi-steel and all gray iron castings for the Packard Twin Six, Packard Trucks and our new Single Six are mixed in Simpson Mixer, and it would be a hardship to do without them. We are effecting a saving of from 30 to 50 per cent. in labor."

Packard Motor Car Co.

The Simpson Mixer—
is economical and efficient for all kinds of sand mixtures in foundries producing steel, grey iron, malleable, brass and aluminum castings.

The Six Points of Perfection

1. Correct size and speed of mullers.
2. Effective arrangement of plows.
3. Automatic discharge.
4. Large capacity per area of floor space occupied.
5. Minimum power and maintenance cost.
6. Considerably less new sand and binder required.

Write for Pamphlet No. 50 and List of Users

NATIONAL ENGINEERING COMPANY
Machinery Hall Bldg., 549 W. Washington St.
CHICAGO, ILL.

Write this down

on a large sheet of paper and tack it up on the wall somewhere in a conspicuous place.

If You Want Satisfaction, Service and All-round Economy, use -

B&P Sands

These famous sands from Niagara Pits are sold on a **satisfaction guaranteed** basis. 3 grades Molding Sand, 3 grades Core Sand, 3 grades Pipe Sand. Any kind of Building Sand.

A Partial List of our Satisfied Users

American Radiator Co., Buffalo.
Niagara Radiator Co., Buffalo.
(The abcve two ordered 150 and a 100 cars respectively in 1920)
Erie City Iron Works, Erie, Pa.
Dom. Wheel & Foundries, Toronto.
Fittings Ltd., Oshawa.
Can. Fairbanks-Morse Co., Toronto.
Can. General Electric, Toronto.
Can. Iron Foundry, St. Thomas.
Grand Trunk Railway System, Montreal.
Victoria Foundries, Ottawa.
International Malleable Iron, Guelph.
Katie Foundry, Galt.
Goldie & McCulloch, Galt.
International Harvester Co., Hamilton.
Dom. Steel Products, Brantford.
Can. Westinghouse Co., Ltd., Hamilton, Ont.
Wm. Hamilton & Sons, Peterboro.

Benson & Patterson
STAMFORD, ONT.

WHITEHEAD'S KAOLIN

Most reliable material for lining and patching Cupolas, Furnaces, Ladles, etc., saves time, labor and firebrick.

E. B. FLEURY
AGENT
1609 Queen Street W.
TORONTO, ONTARIO

FOUNDRY PRODUCTION

WE DESIGN
Industrial Plants
Power Plants
Foundries
Machine Shops
Bridges
Hospitals
Banks
Public Buildings

AND MAKE
Reports
Estimates
Appraisals

Adequate foundry facilities, ample floor space, proper ventilation and lighting are features in foundry design, which, in connection with operating efficiency, will insure maximum production.

It will pay you to consult us on your foundry problems.

The Osborn Engineering Co.
CIVIL, MECHANICAL, ARCHITECTURAL ENGINEERS
2848 PROSPECT AVE. CLEVELAND, O.

You Get—

Best Prices-Highest Quality -Prompt Deliveries

When You Specify

VENANGO

MOLDING SANDS

Nowhere else on earth can you obtain molding sands of the same high quality as Venango Write for samples and see for yourself. Venango service means convenience. You tell us your needs—we guarantee satisfaction. Don't put it off. Write now.

Sands *for*

Steel
Malleable
Brass
Aluminum
Furnace
Light Grey Iron Castings.

VENANGO SAND CO.
FRANKLIN, PA.

"VOLTA"
Electric Furnaces

ELECTRIC STEEL FURNACES
100 lbs. to 15 tons Capacity

GRAY IRON CASTINGS
Electric Furnaces for making Gray Iron

ELECTRIC BRASS FURNACES
Made in standard sizes of 1/8, 1/4, 1/2 and 1 ton capacity.

Electric Furnace Accessories of All Kinds

In order to meet and overcome strong competition you should reduce your production costs as well as metal losses. This can unquestionably be done by operating an electric furnace. Let us convince you that this is true.

The Volta Manufacturing Company, Ltd.
WELLAND, ONT.

CLEVELAND
"Pistol-Grip" Chipping Hammer

Easy To Hold

Easy To Control

Also Furnished with "Enclosed" Handle, Outside Latch if preferred

Cleveland Chippers are "Speedy" and efficient Tools. They operate without any "Recoil" and are easy to hold on the work.

They are "Ideal" for the Foundry as they are "Dust-Proof" and always on the job.

Cleveland Sand Rammers For Floor, Bench and Core Work
"Beat Them All"

For Speed — Power — Efficiency and Economy. Men like them as they have no "Recoil" and when running "lift" and "carry" their own weight. Try one and note their resiliency.

Bowes Air Hose Coupling
"Pleases Everybody"

Instantly connected or disconnected.
Absolutely "Air Tight" under all pressures.
All sizes in stock.
Write for Bulletins 44-46 and 48

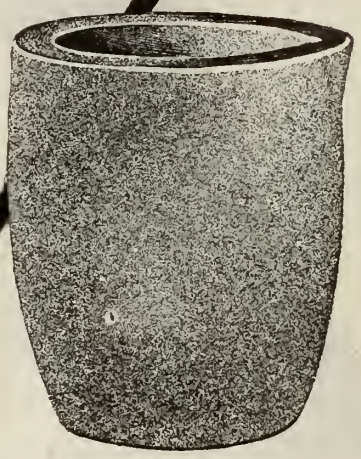
Cleveland Pneumatic Tool Co., of Canada, Ltd.
84 Chestnut St., Toronto
337 Craig St. W., Montreal

DIXON CRUCIBLES

From graphite mine to finished crucible, the entire process is in the hands of Dixon operatives, many of whom have made the manufacture of Dixon Crucibles their life-work.

Each crucible that bears the name DIXON carries the endorsement of an organization which has been through every stage of crucible evolution.

Write for Booklet No. 27A.



Joseph Dixon Crucible Co.
Jersey City, N. J.
U. S. A.
Established 1827

Canadian Agent:
Canadian Asbestos Co.
60 Front St. West
TORONTO

WHITEWASH your FOUNDRY WALLS PARAGON SPRAYERS

Will Cover **100** square feet per **Minute**

Paragon Sprayers Do Not Clog

Send for Booklet

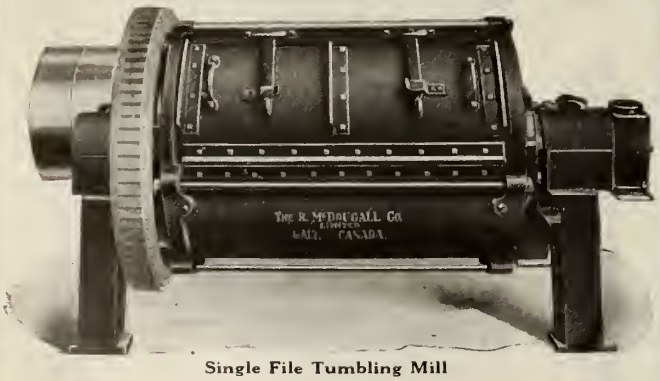
Manufactured only by
THE CAMPBELL-HAUSFELD CO.
General Offices and Works: HARRISON, OHIO

Exhaust Tumbling MILLS

Constructed of heavy steel plate

BUILT for long, heavy service, McDougall mills are in all respects high-class products. Equipped with renewable inside end linings, ring oil bearings and many other improved features.

Write for Literature.



Single File Tumbling Mill

Manufactured in Canada by
THE R. McDOUGALL CO., LTD.
GALT, ONTARIO

Buffalo Brand VENT WAX

Easiest and Best Way to Vent Any Core

Buy It in Canada at

Dominion Foundry Supply Co., Ltd., Montreal and Toronto.
E. B. Fleury, 1609 Queen St. W., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hyde & Sons, Ltd., Montreal, Que.
Standard Machinery & Supplies, Ltd., Montreal, Que.
Webster & Sons, Ltd. Montreal, Que.
E. J. Woodison Co., Toronto, Ont.

Give it a trial

Why Sand Screening

is now the simplest instead of one of the biggest time-taking tasks

Type "V"

The Combs Gyratory Foundry Riddle is the only really portable riddle made. It weighs about ninety pounds and a man can carry it wherever needed. Just suspend it from any convenient support, screw the attachment plug into any lamp socket and it is ready for work. It can be suspended right over a flask. It is capable of supplying as many as twenty men.

THERE was a time when sand screening was always done by hand. It was a long drawn-out tedious job. It took a lot of time. And at the end of the week figured as one of the biggest costs in making castings. To-day things are different. Thanks to the

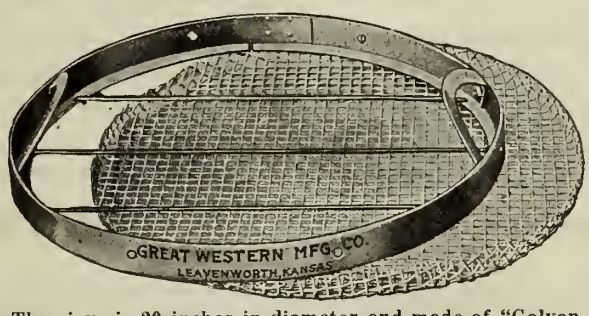
COMBS GYRATORY FOUNDRY RIDDLE

progressive foundries are cutting their sand screening costs to a fraction. The Combs Riddle sifts sand faster than one man can shovel into it and because of its portability, strength, efficiency and small operating cost is the most desirable for every purpose.

The Combs Riddle has a true gyratory motion which gives double the capacity of any reciprocating machine of the same size. There are no legs to get in the way of the shovel and a wheelbarrow can be run under it. The one-sixth horsepower motor demands little power.

8 Big Points

1. The design is symetrical and compact.
2. The frame is rigid and strong.
3. Only one bearing outside the motion.
4. Totally enclosed motor; all bearings dust-proof.
5. There are no gears.
6. Easy adjustable sieve.
7. Mixes as well as sifts.
8. Economical to operate.



The sieve is 20 inches in diameter and made of "Galvanized After Woven" Wire cloth. It is held in place by an improved clamping device and can be removed, dumped and replaced in a second. Made in five different sizes of mesh. New rims and bottoms at nominal cost.

Made in Canada

This Riddle is now made in Toronto under Canadian patents and can be purchased with Canadian funds, thus eliminating any loss for "exchange." Write your name and address on this advertisement and mail it to us for full particulars, prices, etc.

GREAT WESTERN MANUFACTURING CO.

Leavenworth, Kansas, U.S.A.

TRUSCON FLASKS
Give a Bigger Day's Work

Made of Best Pressed Steel

Strong and Light in Weight

STRENGTH
without excess weight

Your molders are expending their strength in lifting tons of unnecessary weight if they are doing their molding with old-fashioned flasks. You pay for this wasted energy. The use of Truscon Flasks eliminates this waste and permits more and better work.

Truscon Flasks are designed to have ample strength without excess weight. The thickness of the shell varies from 1-8″ to 1-4″, depending upon the size of the flask, the weight of the sections and the kind of metal to be poured.

HANDLED
with greater ease and speed

Suppose you are using foundry flasks weighing 128 pounds each. Now think of the labour that would be saved by your molders if they handled TRUSCON Flasks of the same capacity weighing 40 pounds **less.** TRUSCON Flasks are handled with great ease and speed, and foundries now using them are showing a bigger and better day's work per man. TRUSCONS are built to stand hard usage and will outlast a number of cast iron flasks.

Equip your foundry now with TRUSCONS—a safe and paying investment. A flask for every purpose.

TRUSSED CONCRETE STEEL CO. OF CANADA, LIMITED

WALKERVILLE, ONTARIO, CANADA

TRUSCON FOUNDRY FLASKS

Dings Magnetic Separator

One shop's "dirt" is another shop's profit--

SOME foundries have concluded that magnetic separation, to reclaim iron and clean molding sand, won't pay. Their excuse is that their foundry is too small or that the amount of iron in the refuse is too insignificant to warrant separation. Most of these foundries have **jumped** at this conclusion.

OTHER plants have pried deeper into the subject of magnetic separation. They have found sources of saving that could not have been revealed by a hasty investigation. Not a few of them took the short cut in securing this valuable information.

THEY put their facts and figures up to specialists—Dings Engineers. What many shops call "dirt" they now call "profit." Or to carry this to its logical conclusion, their profit is another plant's loss!

ARE YOU erroneously presuming your foundry is too small for magnetic separation? Are you underestimating the saving magnetic separation effects? Is your competitor gaining a point here? Can you give a satisfactory answer to these questions without first going over the facts that this organization will gladly put before you without obligating you in any way?

Just Put your problem up to the Dings Company—Specialists in Magnetic Separation

DINGS MAGNETIC SEPARATOR CO.

Home Office and Works
800 SMITH STREET, MILWAUKEE, WISCONSIN

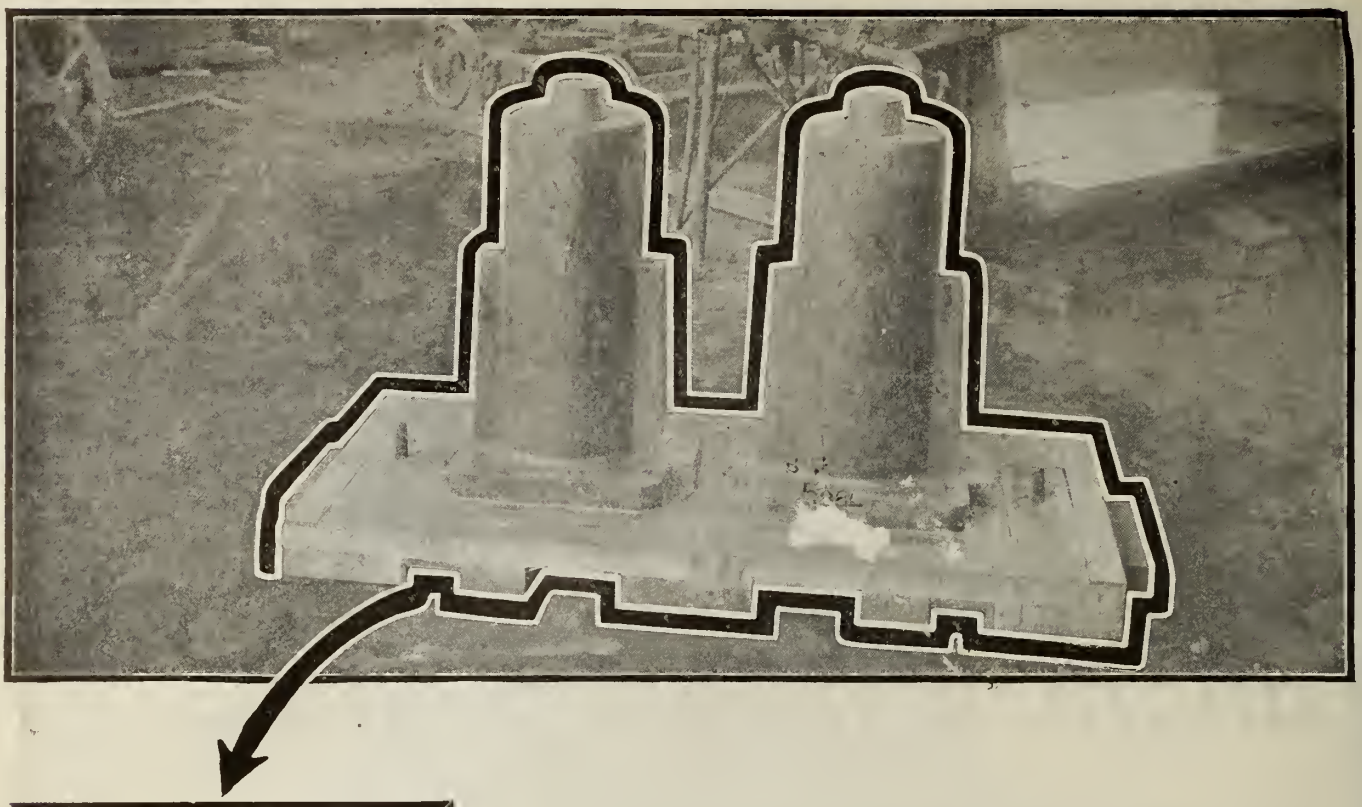
NEW YORK
52 Vanderbilt Ave.

DENVER
1718 California Street

DINGS
Reg. U.S. Pat. Off.

DETROIT
805 Hammond Bldg.

RICHMOND
1905 E. Main Street



Machine moulding in a jobbing foundry for example, cut expenses on this job as shown below:-

Combined weight, 626 lbs.
Flask (inside) 37″ x 17″ x 26″ high.
Before mounting one man put up 2 moulds in 7 hours.
After mounting four men put up 20 moulds in 7 hours.
Labor required for moulding, coring, closing and pouring.
Before — 4½ man-hours.
After—1 8/10 man-hours.
Cost of mounting pattern including labor and materials, $24.00.
Labor cost reduced 57% by machine moulding.
Cost of pattern-mounting saved on first 9 moulds poured.

Swollen costs can't be passed on.

THE easy days of extravagant manufacture (with the buyer footing the bill), are past and gone. The buyer has grown sternly critical and is again measuring the value delivered. Successful selling now rests on right prices. Right prices, in turn, depend upon efficient production. Machine-moulding must be adopted by scores of concerns which until now have been able to "get by" on less economical methods.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
Main Office and Factory
5401 Hamilton Ave. Cleveland, Ohio
New York San Francisco

OSBORN

MOULDING MACHINES

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Member of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

Casting a Ten-Ton Lead Keel in an Iron Foundry

Cast in Three Sections, and After Being Securely Bolted to Bottom of Boat, Was Fused Into One Complete Keel. Being Ballast for Sailing Boat.

THE melting and handling of lead is probably the easiest class of metal working which a foundryman could undertake, providing he understood its nature, but the process is so different from iron founding and the demand for lead castings so slight that very few establishments would be equipped for filling an occasional order and few foundry foremen would feel like experimenting with it.

Lead melts at a temperature of 325 degrees whereas iron requires approximately 2,300 degrees, so it will be seen that the melting is easily accomplished, although care must be taken not to get it too hot because it not only oxidizes, but actually evaporates and is carried away in a thick, yellow smoke. It has another characteristic which must not be overlooked viz., its weight. Iron has a specific gravity of 7.8 while the specific gravity of lead is 11.38 or half as heavy again as iron. From this it will be seen that greater precaution would have to be taken to guard against the mold straining or giving away. This, however, is greatly overcome by the fact that lead having so little heat in it there will not be much likelihood of gas being created in the sand of the mold and consequently very little tendency on the part of the mold to scab, thus making it possible to ram the mold quite hard.

Lead, on account of its weight and the ease with which it can be fitted into place, coupled with its comparatively low price, makes an ideal material from which to cast the keel of a racing clipper or similar boat. While the sailing vessel may be dying a natural death in regard to freight and passenger service, the sailing yacht is more popular than ever with those who can afford to own and man it. Hundreds of these boats are now to be seen on the lakes; and one of the most recent additions to the fleet is the "Zavorah" owned by Mr. Duggan, president of the Dominion Bridge Co., of Montreal. This is what is known as a combination cruiser and yacht and is expected to hold its own on the race course. It is a boat 60 feet in length, 14 ft. beam and a draught of 7 feet, and was launched from Robinson's boathouse, Hamilton, Ont., a few weeks ago.

Like most foundry work, the founder's work is hidden from view. On the bottom is a lead keel 25 feet long, 3 feet deep, 18 inches wide at the top, and weighing ten tons. This keel was cast at the foundry of the Otis-Fensom Elevator Co., Hamilton, and a short story of how it was accomplished will be of interest.

The Otis-Fensom Elevator Co. is, in a way, a specialty shop, manufacturing nothing but elevators. But the elevator covers a big field in itself, so that the foundry is a well-equipped foundry for doing most any kind of work. One thing which is not much called for in elevator work is pit work, but during the war this company made a considerable number of lathe beds for an American company, and of course had to provide pits and large copes. These pits were not of the proper dimensions to suit this keel and there being but one on order it was not considered worth while to dig out an-

Some Leading Articles in This Issue

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other pit, so it was decided to make the mold above ground and utilize the big copes spoken of along with other heavy copes which happened to be part of the equipment required in their regular work. At one end of the foundry and probably one hundred and fifty feet from the cupola is a concrete wall about six feet high and shaped like a letter L to back of which flasks were stored. This formed two sides or rather one side and one end, for the drag. For the other side and end the heavy iron copes were stacked up to the proper height and by piling three tons of weights on top of them they were held secure. The drag portion of the mold was made in this improvised pit in the same manner that it would have been bedded into the floor.

After getting the parting made the eope was rammed up in three sections. Three iron copes were placed in a row about 4 inches apart at the ends. These spaces were intentionally left to be used as feeding heads. Other risers might have been placed on the job but these joints could not be made perfect without a lot of extra work and this made a good type of feeder as it reached all the way across the casting and made it possible to do a first class job of feeding. This was of prime importance when we consider that it took five hundred pounds of metal to feed the job after the pouring was done.

As will be seen by the illustration the keel is of uneven design on the top and has a slot 9 feet long and two and one half inches wide through it from top to bottem, to allow for the centre board. In addition to this it had eighteen bolt holes cast in it so that it could be bolted to the boat. The center slot was made with a dry core composed of sharp sand mixed with Woodison's black compound. The bolt holes were made by using wooden plugs coated with a paste composed of

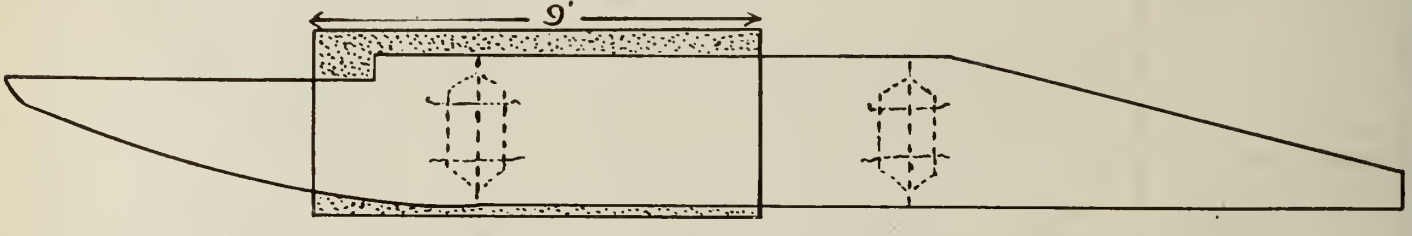
To avoid trouble it was split crosswise into three separate pieces as shown by the dotted lines on the illustration which as will be seen, cut through the center board opening. This splitting was done by inserting thin sheet iron plates into the mold in such a manner as to entirely separate the two parts. This would of course make it into three separate molds and would necessitate making three jobs of pouring. The keel had to be in one piece when on the boat and this was accomplished by burning the parts together with melted lead after they were fastened to the boat. To facilitate this, pockets were cast at each splitting plate, but not quite the full width or height of the cross-section of the casting. These pockets were formed by drilling a couple of holes in each splitting plate and putting a core of the proper shape and size on each side and wiring them together through these holes. Green sand was used in making the mold, but a sort of special mixture was used for facing to prevent the lead from cutting in on account of its greater weight than iron. This facing consisted of three barrows of old sand off the heap, two barrows of new heavy molding sand and one barrow of new pipe sand. To this was added two parts of flour.

The three pouring gates were placed on the parting of the mold and cut into the side of each section. To take ten tons of melted lead and pour the mold would have been a simple enough job, but it would tend to strain the mold more than was the case in pouring it in instalments and besides the ten ton ladle was not available. The ladle equipment of this shop consists of a three-ton ladle and several smaller ones. In front of the cupolas is a track with bogie car carrying two ladles. This is so arranged that when one is fitted with melted metal the bogie is shoved along to allow the metal

holds a ton and a half of lead, was taken by the electric travelling crane to the mold and half a ton poured into each gate. The empty ladle was then taken back and the second one handled in the same manner, each section of the mold getting its quota. This process was continued for half an hour, when the mold was full. The time between pours was never enough to allow what was in the mold to set, and as a matter of fact it would require to be perfectly hard before it would make any difference as it does not act like iron. The metal which was in the bottom of the mold would undoubtedly be setting to some extent and during the half hour required to fill the mold it would have done a lot of the shrinking which would have to be done, but in spite of this it took another half an hour of feeding and an additional five hundred pounds of metal before the casting was thoroughly set and sound.

After the lead was all drawn from the cupola, the blast was again put on and all the dross blown out, when the blast was again temporarily turned off in order to allow of the breast being rammed in, when it was again turned on and a heat of iron taken off. Lead is not a metal which will mix with iron, and consequently it does it no harm, but, strange as it may seem, any lead which might get into the ladle of iron will float on top of the iron in spite of the fact that it is fifty per cen. heavier than the iron.

Had the easting been made in one piece as was the original intention, it would have been much easier for the foundrymen and would have been out of their hands as soon as it was taken from the mold. In the present case it had to be made into one piece after it was put onto the boat. This was an interesting job. The three sections of keel were bolted on separately, the holes



Ten ton lead keel for boat, cast in Hamilton foundry.

core oil and dry blacking which was afterwards black washed and then put in the oven and dried. These wooden cores were placed the same as any other core in the mold and were easily removed later on leaving nice, smooth holes.

Made the Casting in Sections

The original idea was to make the casting in one piece and the pattern was made accordingly but it was feared by those who would have to handle it after it left the foundry, that on account of the center board slot leaving that part of the casting weak and the ends so heavy it would be apt to be bent out of shape in transferring it to the boat builders, particularly when it was considered that ten tons of metal in one piece is not easily handled.

to run into the other ladle while the crane is being hooked onto the filled one. This system was utilized in pouring the lead.

The cupola was prepared in the usual way with the exception that the breast was left open. Coke to the depth of twelve inches above the tuyeres was lit through and the blast turned on to liven it up and when in a fairly incandescent condition the blast was turned off and some of the lead charged on. The lead was not charged any faster than it could be handled, because with a good coke fire such as this, lead takes practically no time to melt. Two ladles known as "ton" ladles were put on the car and as soon as one was filled and moved along so as to let the lead into the second ladle, the first one, which by the way

which were made by means of the wooden cores were abundantly large, and the holes which were bored in the bottom of the boat were also loose. This made it easy to move the keel parts in order to adjust them. When properly adjusted the joints were clayed all around and well secured and melted lead poured into all the spaces including the pockets spoken of in making the mold. Lead was also poured from the inside of the boat into the spaces between the bolts and the keel. After tearing away the clay and polishing the joints the job was completed and the keel and the boat were securely bound together, making one substantial piece as strong as Gibraltar.

The Otis-Fensom foundry, we have already pointed out, is especially equip-

ped for doing passenger and freight elevators of every description. This includes belt driven, electric, hydraulic and hand operated, and many interesting foundry stories could be written on the work which is done here. A simple casting like a drum with two sets of arms, and with a flange on each end and a spiral groove running the entire length of the drum, does not attract much attention when in use on an elevator, but it represents some nice work in the foundry.

The foundry building is 300 by 120 ft., and the equipment consists of two ten-ton electric travelling cranes, two three-ton cranes, two fifty-four inch cupolas, four rumblers of different sizes, four Tabor combination molding machines for medium sized work and one plain jolter in the floor for heavy work. When running normal, forty molders are employed. These along with the helpers and laborers will run the force of the foundry department up to approximately one hundred men. Everything possible is done to make the shop an ideal place to work. The shower bath installations will perhaps surpass anything in the country for the size of the shop. One hundred and one closed-in steel lockers, each containing a shower bath unit are provided. These lockers have locks and keys and each man has his key. When he comes in the morning, he goes into his locker, disrobes himself of his clothes and puts on his duds for working. After his day's work is done he returns to his locker, strips himself and takes a good shower bath, dries himself and togs up like the gentleman he was when he entered in the morning. This foundry is, of course, only one department of the Otis-Fensom Elevator Works, but is the one department which is of interest to readers of "Canadian Foundryman."

Mr. James Allan is foundry superintendent, and Mr. S. I. Pickard is foundry foreman.

Cutting Costs In Handling Materials

By Using the Space Overhead for Trucking Purposes Instead of Using the Floor, a Great Saving Is Accomplished

THERE never was a time when the men who carry the burdens of the foundry and steel plant operation had such difficult problems to solve, problems that are the very backbone of the entire industry. The root of all these difficulties is fundamentally the same, the demand for lower costs; but just as the demand for production was met by them, likewise this new situation will be solved; not without the addition of many new gray hairs, however, for in their close application to these problems strong men turn pale and age overnight, it seems. To begin with there are certain overhead items such as the charges of capital invested which cannot be changed at the present time, but there are an unlimited number of important elements that can be reduced, most of which are simple in themselves when properly analyzed. This analysis need not start with labor costs because most plants have readjusted their labor costs to a substantial basis.

Eliminate Waste.

Our advice would be: scour the works, find every leak and waste and eliminate them. To do this you must have accurate records, but don't make the mistake of paying double what they are worth by duplication on different reports, then be sure that the report contains information that is of value to you, that it is not too complicated for its purpose, that it does not use up space for information that is never recorded and thus waste your foreman's time, paper, printing and storeroom space. Now, this is but one simple item, yet the same analysis can be made of every machine, every furnace, every motor, and so on throughout the plant with a marked saving in every instance. The larger items, such as the proper burning of fuel, getting every heat unit out of the fuel, stopping all steam, water and other pipe line leaks, have been amply taken care of, but it may pay to check them up. There still remains a valuable asset that hasn't been touched; get the viewpoint of your workmen as to where they see mistakes and waste, sift out the slacker's opinion and you'll have many worthy means of saving.

Use Ceiling Instead of Floor

There is one place in most plants that it would be well to investigate as a possible means of relief. I refer to the ceiling as a means of transportation. And when we consider that the intra-plant transportation problem is one of the real big items of expense in every plant, it will not be amiss to pause for a second and consider the possibility of saving there. In most plants floor space is at a premium, while the space overhead is little used except where the buildings are so constructed as to permit of crane installation.

As a result, the floors are crowded and it is quite a problem to get around easily and with dispatch to convey the work in progress from place to place.

The answer to this problem seems to point to the overhead method of transportation, but crane installations are large and costly and in many rooms would be entirely impractical. As a remedy for this condition, the monorail system with its heavy I beam structure has been developed. But here, again, experience has demonstrated that the monorail is not sufficiently flexible for most plants and then its installation is quite an engineering proposition, which, in many cases, makes its selection prohibitive.

There has, however, come forth quite recently an entirely new development that may be the key to the solution of this perplexing problem. It is the Electric Tramrail, which actually operates overhead and yet is so flexible that it does reach into every nook and corner of the plant.

In use, the tramrail will pick up the load, make a straight bee-line over furnaces, mills, machines, railroads, etc., to the desired location. Then its almost human ability at the billet mills, merchant mills, rod mills, wire mills, polishing mills, drawing departments, storage yards, storage yard for unloading and delivery of coal, taking out the ashes from the power plant and soaking pits, storing of bricks, removal of brickbats, enables one man to do the work of many in but a fraction of the time. With the tramrail, in the wire mill, the blocks are stripped; from the red mill, it takes reels to the pickling vats; from the pickling vats it takes them to the storage yard or to the draw benches, and from the storage yard to the cars.

A most unique feature of this system is the tramrail itself. This rail and its fixtures are of such simple design and thoroughly standardized that any mechanic can layout, order and install this section or a complete system including switches, curves, turntables, etc. And of no small moment is the fact that no more engineering skill is required to install this tramrail than is required to install the ordinary pipeline, for there is a fitting to meet every condition. Curves are no obstacle and neither are switches, for the rail can make as many turns as desired and actually turn in a four foot radius, the switches can be placed as close as every three and one-half feet in any direction.

Can Be Transferred to the Next Story.

Another important feature is its ability to connect one department or building with another that is on a higher level up to and including a grade of 12½ per cent. For transferring to higher levels than this, or to a floor above or below, the tramrail may be installed on any freight elevator and elevated. Consequently, the tramrail can pick up its load carry and put it down anywhere from the basement to the roof, with but one handling.

Flexibility.

The extraordinary flexibility of the tramrail system is reflected in the many different types of carriage and hoist that are possible from the combinations of the standard equipment. Although these types number over 1200, not one sacrifices those essential qualities—all working parts self-lubricated, weather and dust proof. One of the types most favored is the one-ton electric travel and hoist. This piece of equipment is ruggedly constructed which enables it to work effectively and with the greatest flexibility. There are other types, one as effective as the other in its respective class of work; some of these are hand propelled and almost frictionless, others are electrically propelled with travelling platforms, while there are still others that are electrically propelled, and have an electric hoist with either a travelling

(Continued on page 42

Molding and Casting Chilled Flour-Mill Rolls

Designs for the Molds for the Different Methods of Producing This Class of Work Together with Treatise on Process of Machining

By G. O. VAIR

AN INTERESTING piece of foundry work is the making of chilled rolls such as are used in the process of making flour. In watching the automatic machinery in a flour mill, where flour is made by what used to be known as the "new process" after the mill stones which had served for centuries were finally asked to retire, the miller will lift a cover and say "these are the rolls." In looking at the grain passing between the rolls and coming out on the opposite side in the form of partly made flour one is apt to imagine a pair of grooved rollers running together in a similar manner to the feed rollers on a wood working machine, but such is not the case. These rolls are in reality sets of finely cut knives working past each other in a manner similar to that of the mill stones. The grooves which are known as corrugations are cut in such a manner as to form cutting edges, and are cut spirally on the roll so that in revolving past each other the cutting edge starts from one end and works into action as the roll revolves. The rolls and the corrugations must be perfectly true and free from the least semblance of defect. In addition to this they must be hard and close grained enough to stand up against the continuous wear of grinding the grain. A speck in the metal of which the roll is made would leave a portion of the grain unground. To accomplish all of these requirements is not an easy matter but is possible. As our heading implies, they are made in chills.

Before going into details it must be remembered that the chill adds nothing to the melted metal and has no effect whatever on the chemical contents of the metal, other than to prevent, to some extent the annealing which automatically takes place and which converts the combined carbon (known chemically as carbon of iron) into free or graphite carbon. It must also be remembered that the only chance it has to do this is by absorbing the heat from the melted metal into the metal from which the chill is made. From this it will be seen that unless the chill is bulky enough to absorb most of the heat units which were contained in the roll it will not have much effect on its physical structure. As a matter of fact it would not have much effect on the roll, no matter how heavy the chill is if ordinary gray cast iron is used.

From this we must conclude that proper iron is an essential. What constitutes proper iron is a matter where opinions differ, but it should not be hard to figure out. It is no trick to get hard iron, but to get it hard and strong is different.

It might be news to some foundrymen to learn that 12 per cent manganese will make iron that is actually tougher after being plunged red-hot into cold water than if it had been allowed to cool slowly, and it may not be generally known that iron which is plenty hard enough and strong enough will sometimes be so badly checked from the effects of the chill and internal strains

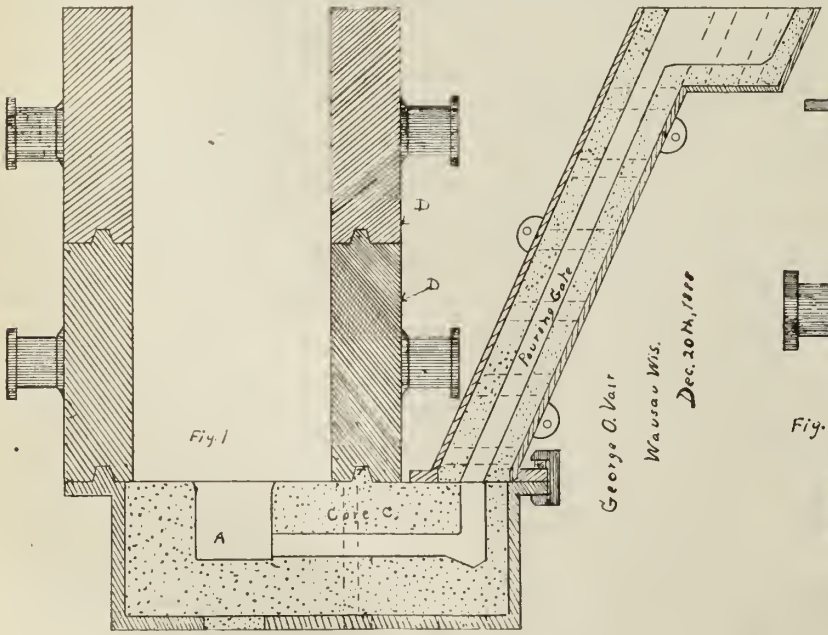


FIG. 1.—Cross section of mold and flask for solid roll.

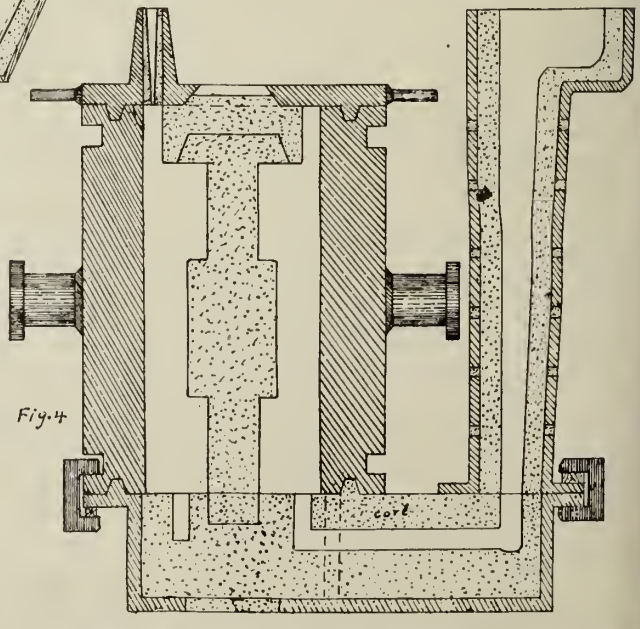


FIG. 4.—Showing cored out roll which must be made by different process.

that the casting will be useless. However, an iron to make a good roll should be low in silicon and low in sulphur and the combined carbon will automatically be high enough. If iron containing silicon .8, Phos. .6, Manganese, .4, Sulphur .04 is melted in a fast melting cupola with plenty of fuel and blast, some of the silicon will burn out and some sulphur will be absorbed but the resultant metal should make clean sound castings with good wearing qualities, and would be almost the same without the chill, but the chill sets the grain on the surface and for some distance inward and also is less apt to make a dirty casting. The experience of Mr. Vair in producing chilled rolls will be of interest. Ed.

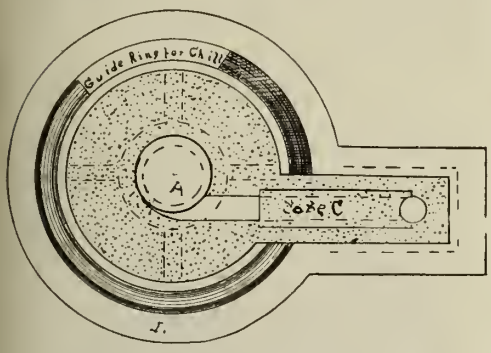


FIG. 2.—Plan view of flask and gate.

Moulding and Casting Chilled Rolls

The production of chilled castings is always a matter of some uncertainty, and depends on the initial effect of several causes: the quality of the iron, the thickness of the casting, the temperature of the iron at the time of pouring, and the conditions of temperature of the iron mould which has a greater effect in "striking in" when the mould is heated than if quite cold. A very thin stratum of earthy matter will almost entirely obviate the chilling effect. A cold mould does not generally chill so readily as one which has been heated nearly to the extent called "black hot" but the reverse conditions will sometimes occur with some brands of cast iron. The chilled portion varies in depth according to analysis of the iron mixture used.

The accompanying drawings illustrate a class of chilled roll that is nuiversally used in all mills in both Canada and the United States for the manufacture of flour. These rolls are about ten metres in diameter and are in lengths of from eighteen to thirty inches or approximately thereto.

The Modus Operandi in the Machine Shop

Before going into details of the founder's part in producing the rolls, a short description of what they have to go through in the machine shop will be in order. The machine shop practice in connection with these rolls can be briefly described as follows:—They are chucked on a machine and both ends cut off at once, then both ends are drilled and bored at the same time. The shafts are next fitted and put into place by hydraulic press. The rolls are next taken to a lathe, and the shafts finished. The next move is to turn the chilled roll in a machine which is constructed for that purpose, the tool which is used being a piece of hardened steel with square edge about two inches long. This metal, it may be imagined does not cut like ordinary iron but is in reality scraped to the proper size. After being brought to approximately the right size, the roll is ground with an emery wheel which brings it to the exact size and makes it perfectly true, after which it goes to the corrugating machine and the periphery is covered with shallow spiral corrugations.

Back To The Foundry

As these castings require to be clean and perfectly free from flaws when finished, one of the most essential features in regard to the moulding and casting of them is the use of a correct type of pouring gate.

The temperature of the iron should also be given due consideration, as it is absolutely impossible to get a casting of this description to finish clean when poured with metal that has become too "dull" in the ladle, and on the other hand it will not improve conditions to have the iron "just right" and then have the pouring gates "all wrong."

The sketches herewith show sectional views of two different methods for casting and gating these skilled rolls.

Fig .1, shows the roll cast solid; and is the way a Canadian foundry successfully cast their rolls. At Fig. 4, is seen the same class of roll as made in an American foundry with equally good results.

Fig. 2, shows plan of flask and pouring gate used for solid roll. At Fig. 3, is seen follower board to receive hub needed being the hub (A), and gates. As the casting proper is formed entirely by the cast iron chills (D) (D). The foundry practice in connection with these rolls is to provide amethod to gate and cast same in the best possible manner.

By referring to Fig.2, it will be seen that the pouring gate is cut on a tangent into the hub (A), thus giving the desired effect to produce a swirl to the molten metal; thereby causing the outside or chill surface to be covered to a higher point by the iron while being cast, than the centre, and also throwing the heavier and sounder iron to the outside thereby holding any accumulation of impurities from the iron, or dirt from the gates, away from the finished face of the roll.

The roll shown at Fig.4, being made

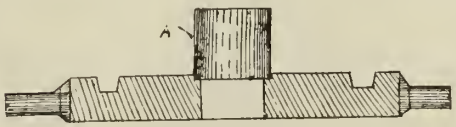


Fig. 3—Mold Board

in practically the same manner as the solid roll described above with the exception that; it is cored out at the centre, and covered with a cast iron plate continuing a "pocket" for a cheek rider. The spiral gate had to be adopted in pouring this roll on account of using a centre core.

As Fig. 4, sketch will be readily understood by "The Canadian Foundryman" readers the writer deems it unnecessary to go into details of both Fig. 1, and Fig. 4.

The sand used for the gates was a dry sand mixture of about as follows; one part molding sand, one part bank sand, one to sixteen of sea coal, wet with clay wash. All gates and pouring basins were black-washed and dried.

In blackwashing the gate and pouring basin a very successful and economical method is to place the same over the blackwash tub, letting it down onto a couple of clamps. A piece of shingle or any flat plate is blocked up against the under side of the gate, when the gate and basin will be filled with blackwash. The plate will now be removed allowing the wash to run into the tub, leaving just sufficient to make the gate and basin well washed and saturated so that when dry the iron cannot possibly cut them

To attempt to give formulae of metal for rolls would be almost out of the question but as an example of what we used where I have been employed I will give the following so that the reader may judge for himself what to use after getting a hint to start from. I might say that Cranberry pig was a high grade silicon iron low in phosphorus and sulphur. One receipt called for 1,000 lbs.

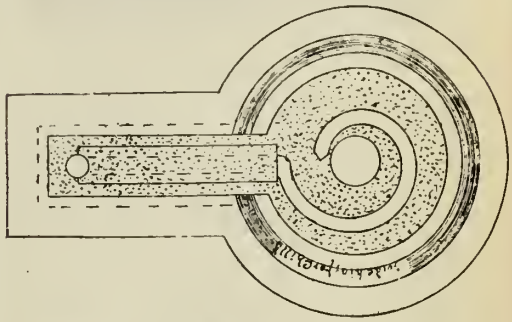


FIG. 5.—Plan of gate for pouring cored roll. Mold board.

of No. 4 charcoal iron with a silicon content of 40 to 50 per cent., 500 lbs., of carwheel scrap and 500 lbs of Cranberry pig iron.

Another receipt called for 800 lbs of charcoal pig, the same as above, 600 lbs of car spring steel, 200 lbs boiler punchings, 400 lbs gates from this mix and 82 lbs of ferro-manganese.. The ferro-manganese was melted in a crucible and poured into the ladle at tapping out time. If this had been put in the cupola an additional 20 % would have been required and then the mixture would have been doubtful.

We had another mixture which called for hermatite pig, white pig and carwheel scrap but I do not just remember the proportions. White pig is not to

(Continued on Page 25)

PATTERNS AND CASTINGS

By W. P. ESSEX

IN the following article the writer makes no attempt to treat the subject of foundry buildings from a technical standpoint, but rather from the viewpoint of the man whose work has brought him in almost daily contact with the foundry, and whose past experience with shop plans, and working conditions, in some of them, has not left the most favorable impressions in his memory. And with justifiable pride the writer notes the progress the foundry industry has made in this country, and the remarkable improvement in design and layout of the newer Canadian foundry buildings.

One of the most interesting features noticeable in foundry construction today is the attention that is given in building, to those most essential factors, light and

Fig. 1—An Ancient Foundry.

ventilation, which are so necessary to the health, comfort and convenience of the workman. And the efforts of the foundry designer and architect today are especially directed towards improvement in design and construction, that will give the best results in the lighting and ventilation of the foundry.

Reference to Ancient Foundry Buildings Extremely Rare

Ancient records, and writers on historical subjects relating to the past, while they frequently mention some celebrated metal worker or notable examples of cast metal of their time reference is extremely rare as to the methods employed by the ancient moulder and founder, for producing these wonderful castings, or the foundries in which they worked; the style of roof, if any, which covered them. Their ventilation, light, working conditions, and many other facts, that would interest us to know, have been generally overlooked when recording the achievement.

Ancient Foundries

The foundries of the early metal casters were no doubt extremely crude. The remains of some of these primitive furnaces if restored as in Fig.1 would suggest a combination of the bee-hive coke oven and the old-fashioned lime kiln that are sometimes seen along the river banks in the limestone districts.

These early works were frequently built on a hillside, or against a bank of earth that would make the approach to the charging hole of the furnace, convenient by means of steps, or an incline path, for carrying up the fuel and metal. Later, hand barrows were used to convey the materials to the furnace top, and in time these primitive and laborious methods were replaced by a small car operated by a windlass on an incline plane.

Primitive Foundries

It is not at all necessary to visit the older countries or go back many years for examples of primitive foundries. For the modern foundry is a product of this continent, and its greatest development well within the period of our own times.

Some years ago the writer just happened upon one of those small pioneer foundries which in the early settlement days had no doubt proved a very present help and convenience to the settler in need of a lye kettle, the cast parts for a bake oven, or perhaps an occasional casting for the adjacent mill.

This little casting shop illustrates the simplest type of building. The lean-to Fig. 2. Its floor dimensions would not exceed sixteen by twenty-four feet, in width and length, and at the highest point not more than fourteen feet. The upright posts were partly hewn, the rafters plain poles, and the roof, covered with a double thickness of rough sawn boards or slabs. The cupola which for crudity was in keeping with the building, was of the solid bottom type, the shell was made of old boiler plates, reinforced up to the charging platform with stone. The wind was furnished by a home made fan of sheet iron, with vanes of wood attached to an iron spider, this contraption was driven by a small engine with an oscillating cylinder.

The little foundry illustrated in the sketch Fig. 3 is about as primitive as the one just described, but the type of building is an improvement over the previous one, in that the roof of the latter is of the gable type. This diminutive iron works, which was a product of the South, was built about 1877, and is described in an old number of "Southern Machinery" by a writer who had been its manager and sole molder. The

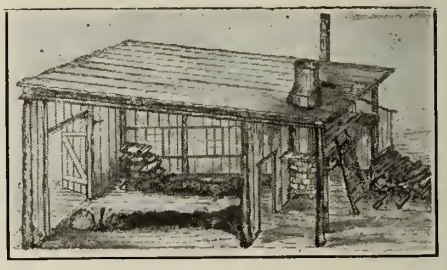


Fig. 2—The Village Foundry.

building was twenty-five feet long, eighteen feet wide, with front and back doors, and a small door on one side with a shed over it. The cupola which stood in one corner, was a square box made of wood almost up to the roof, with an iron stack about four feet high. The cupola was lined up round to the charging door; the corners being filled with brick-bats and mud. The blast was furnished by a fan made of wood, only the wings were made of iron, this was operated by a little upright engine.

The cross section of building shown at Fig. 4 illustrates a design sometimes used in early foundry construction. The timbered roof which was of the king post truss type, was provided with skylights on the side of each pitch. While the purpose of these openings was no doubt to provide more light and ventilation, not often could they be used for either, for seldom was a satisfactory means provided for operating them, other than by climbing up on the roof, and if the sash

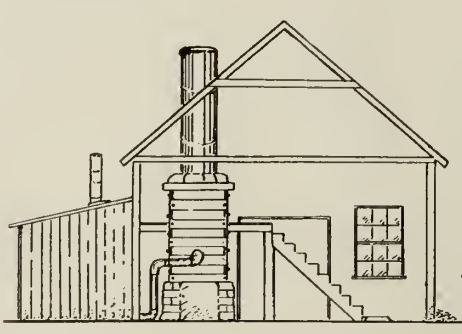


Fig 3 A Pioneer Foundry

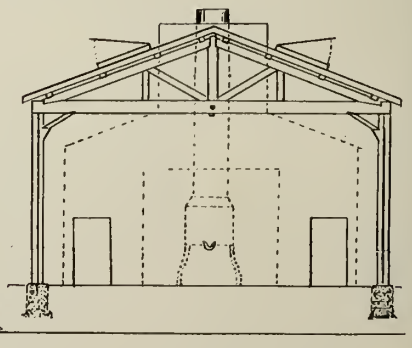


Fig 4 An Early Type of Foundry

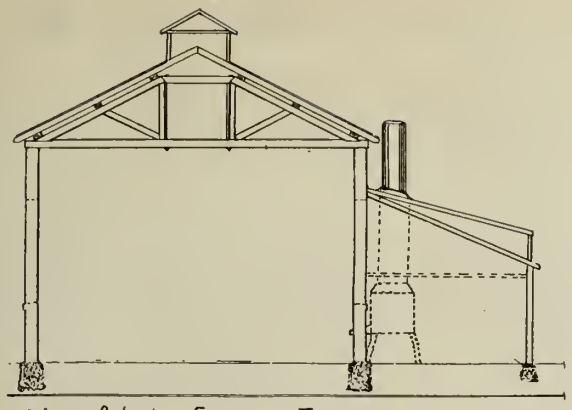


Fig 5 A Later Foundry Type

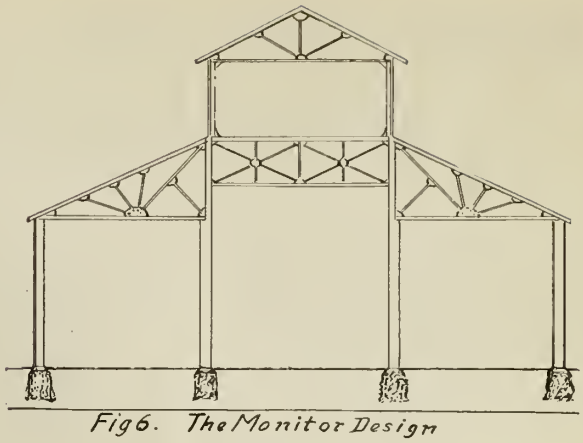


Fig 6. The Monitor Design

should happen to have all the glass in, it was usually so stained with dust, that the light would not penetrate. So that this design insofar as the provision of light and ventilation are concerned, has little advantage over the plain pitch roof.

Later Foundry Types

A style of foundry building which has been popular in later years, is that illustrated in Fig. 5. The framing of this roof is similar to Fig. 4, with the addition of a lantern along the ridge. When properly proportioned, and with ample sash throughout its length, and made easily operatable, the lantern provides a very effective means of ventilation, besides the increased daylight area obtainable. The insert shows the exterior of a foundry of this type.

Possibly the most popular design of foundry building at the present time, is the monitor roof type shown at Fig. 6. This is really an extended form of the lantern roof, which for ventilation by natural means, when there are lower sashes that can be opened in conjunction with those in the monitor, provides the most effective means of ventilation that has yet been devised.

The design of monitor roof shown in Fig. 6, in which the ridge of the monitor is the highest point, is not the most efficient design for obtaining the possible maximum amount of sunlight, or the most effective ventilation, as the projecting leaves cast shadows which during a portion of the day dim the illumination to a considerable extent. The area in the angle of the roof, which is above the line of sash, holds the arising gases which may descend again to the lower levels unless an outlet is provided in some form of a ventilator along the monitor's ridge.

The Latest Designs of Foundry Buildings.

In Fig. 7 is shown a design of monitor, which if not the newest, illustrates the latest ideas in foundry roof construction. In this design it will be seen, that instead of an ascending pitch to the ridge, the roof is in the form of a V, or inverted gable. The advantage of this improved design is apparent, as there are no pockets to hold in suspension the arising gases, or prevent their free egress through the open sash at the monitor sides. And no projecting eaves obstruct at any time the admission of the fullest possible amount of sunlight.

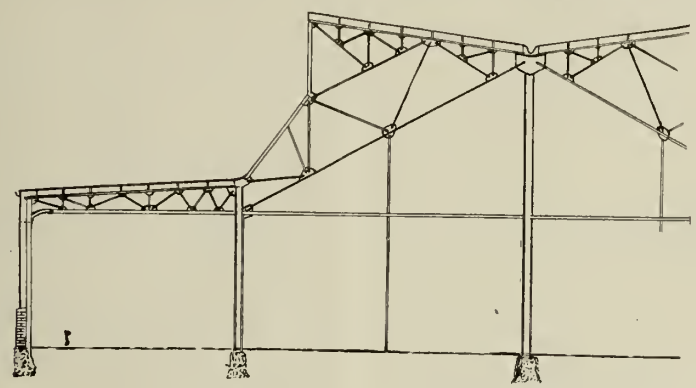


Fig. 7.—The Super Monitor.

The Saw-Tooth Roof.

The saw-tooth roof type of foundry is a design that has been widely exploited, much discussed, cussed, and sometimes condemned. But the fact remains that in the construction of some of the largest and most modern foundries on this continent, the saw-tooth roof has been adopted with considerable success, as experience has demonstrated that no other type of roof equals the saw-tooth for illuminating the building by sunlight.

While industrial building construction engineers and experts generally, admit that superior daylight illumination is possible with the saw-tooth roof, they cannot claim for this design the same efficiency in ventilation.

To take advantage of the daylight illuminating feature of the saw-tooth, and at the same time provide an effective means of ventilation, the designers of the foundry shown in Fig. 8, have adopted a special system of ventilation. The ridge or point of each tooth is provided with ventilators of the lantern type, see AA Fig. 8, in sections of fifty foot length, the ventilating shutters being operated from the inside of the foundry. This system, it is claimed, has been very effective in carrying off the foul gases, and providing a natural circulation of fresh air throughout the buildings.

Fresh air and sunlight are as necessary as food to maintain the health and strength of the individual, and the wonder is that men have lived and worked as long in some of these dark, ill-ventilated buildings, that have housed them, in many instances, for the most years of their natural life. Fresh air and sunlight nature supplies us with in abundance, and it is pleasing now to see the efforts that are being made to supply our industrial buildings with these life-sustaining elements of nature by natural means.

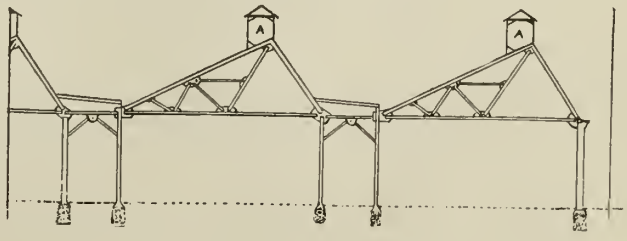


Fig. 8.—The Saw Tooth Type of Roof.

Bronze Antiquities From Ancient Boscoreale

Treating on the Eruption of Mount Vesuvius in the Year A.D. 97, and the Bronze Castings Which Have Been Unearthed During the Last Few Years

By F. H. Bell

IN THE last few issues of Canadian Foundryman, there have appeared some interesting articles from the pen of Mr. W. P. Essel on the subject of ancient foundry work, mostly of bronze, which not only tended to show that bronze was the principal commercial metal of those bygone days, but also to show that the workmen of those days were well up in the art and science of molding and founding metals.

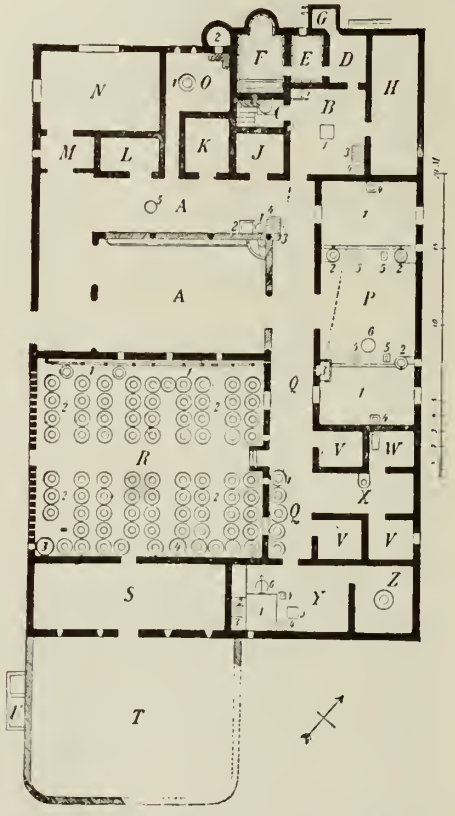
There is no reason why they would not be as intelligent in those days as they would be if born during the present century. It is nevertheless reasonable though to conclude that each generation has the opportunity of learning all that those before them knew, and in addition has the advantage of modern inventions which keep springing up from year to year, but with all the advantages of modern ingenuity, which certainly lessens the physical labor of the workman, it is doubtful if we have any better mechanics today than those who dwelt upon the earth thousands of years ago.

We moderns are apt to picture the work of the ancients as crude, compared with the work of today but to look with one's own eyes upon castings which were made at least eighteen hundred years ago and not only observe that the workmanship was the same as would be done today, but also to notice that the habits and customs of the people were practically the same as our own is truly marvelous.

It was my privilege a short time ago to visit the Field Museum at Chicago and personally examine a number of antique specimens taken from the ancient villages which are being unearthed in the neighborhood of Mount Vesuvius which behaved so badly in the last quarter of the first century.

Most of us will remember the story in the old school reader about the destruction of Pompeii. In my childhood days I used to vision myself, after I had made my fortune, spending it on that very spot. It seemed to me that Pompeii would be the most interesting place which could possibly be any where in the world. To look upon a pile of ruins such as the Stadium at Rome would be of little interest compared with looking at a city just exactly as it stood years ago. Pompeii is a familiar name because it was the first of the buried cities to be discovered but others are now being brought to light.

Vesuvius is not a part of any chain of mountains but is a lone mountain rising up from the plain of Campania. It is about four thousand feet high and thirty miles in circumference. It was undoubtedly an active volcano originally but as far back as history goes it had only been recorded as a mountain with a lake on top of it. This lake was nearly a mile in diameter and made a splendid resort for the inhabitants of the towns which were situated at the base of the mountain. The various eruptions which have taken place since the first century have changed the map to considerable extent so that now this great volcano is quite a distance inland. Before the eruption which buried so many towns, the bay of Naples, then known as the Gulf of Cumae extended up to the base of the mountain and at the juncture of the bay and the



Plan of Villa Rustica in which the famous treasure of Boscoreale was found.

river Sarnus which flowed into it, lay the city of Pompeii and all around the thirty miles of circumference of the hill were other settlements of more or less importance, but which have been little known, for the reason that they were so completely buried that their location was lost whereas Pompeii was only buried under a few feet of ashes and was not so hard to locate.

In the illustration will be seen the plan of a house which has recently been unearthed at Boscoreale, and the bronze furniture, bath tubs, hanging lamps, garden tools and pitchers which were taken from the building.

The small but fertile plain of the Sarnus, which lay on what is now the Bay of Naples between the Sorrentine peninsula on the south and Vesuvius on the north, and extending back in a north-easterly direction to the foot-hills of the Apennines, was anciently, as now, highly cultivated and thickly peopled.

Besides the towns of Nuceria in the south-eastern part of the plain, Stabia, now Castellamare, in the south-west, and Pompeii in the north-west at the mouth of the river, there were here as in the entire region about the bay, numerous country-houses and estates belonging to wealthy Romans. Many of these villas, as they were called, were situated on the slopes of the mountains, particularly the Mons Lactarius above Stabiae and Vesuvius opposite.

For over eighteen hundred years habitation in the neighborhood of Vesuvius has been largely dependent on the caprices of that volcano, the outbursts of which have destroyed or devastated tme after time the towns at its base. In earlier days, however, this was not the case. The geographer Strabo, who flourished in the reign of Augustus, describes it as covered with beautiful fields, except at the top, which, though level for the most part, looked as if it had at some time been burned by subteraneous fires. The architect Vitruvius, who lived about the same date, mentions a vague tradition of ancient eruption, but there is no authentic record of any such event.

This long period of repose came to a sudden end on the 24th of August of the year 79 A.D. Early in the morning of that day the apparently extinct volcan, after several premonitory shocks of earthquake, sent up an immense cloud, like an umbrella-pine in form, which overshaded the surrounding country and drove the terrified inhabitants to flight. Commander Pliney of the Roman fleet at Misenum sailed to the help of the distracted inhabitants but he with others of his crew were suffocated in the sulphurous vapor which overspread the city. Only those who left the vicinity immediately were saved, for in the afternoon and the following night and during the part of the succeeding day there fell from the cloud a dense shower of pumice-stone and fine volcanic ashes which covered the entire plain of Sarnus, including Pompeii and Stabiea, to a depth of from ten to forty feet. At the same time Herculaneum, a small but wealthy seaside resort on the west side of the mountain, was buried beneath torrents of ashes and mud which subsequently hardened into a solid mass from seventy

to one hundred feet in thickness.

The ruin which this visitation brought upon these cities was complete and irremediable.

Though Pompeii and Stabiae were not so deeply buried as to preclude quite extensive excavations on the part of contemporaries for objects of value, they could not again be inhabited, while the sites more immediately adjacent to the mountain lay so far beneath the newly formed surface of the ground that they were left undisturbed throughout antiquity. They accordingly have preserved for us even more complete than Pompeii the appurtenances of their civilization, and the exact conditions in which the catastrophe found them.

The exploration of these buried cities and the recovery of the culture which they represented have been pursued intermittently since the year 1711, and now, after the lapse of nearly two centuries, may be said to be about half completed. A large part of the enormous collections in the museum at Naples, including nearly all of the wall-paintings and bronzes, came from these sites, and though for a long time the excavations have been conducted on a rather small scale, new finds of importance are frequently made.

The most interesting discoveries of recent years have been made near the above mentioned village of Boscoreale, about one and one half miles north of Pompeii. Here a number of sumptuous farm-dwellings were brought to light.

The first, which was also the richest in finds was discovered in 1876. At that time only a beginning of excavations was made. The work was resumed in 1894 and completed in 1898 by the proprietor, Vincenzo De Prisco. This villa was a rectangular establishment, about 80 feet by 130 feet in size, consisting of a lower story which contained living rooms and bath and departments for making and storing wine and olive oil and an upper story, which was probably devoted mainly to sleeping rooms. The arrangement of the lower story is what is seen in the illustration here shown. Of course I did not see this building but I saw some of its contents covered with verdigris just as they were taken from it. The description which I received of the building was, however, sufficient to convince me that the contents of each room left no doubt as to what it was used for. The kitchen and dining room etc. could be easily identified, but to show that they were up-to-date, the room marked F was the bath room and contained a bronze bath tub. C had the aparatus for heating water. E. had a reservoir for holding water. D was the dressing room and G was the toilet. In Z was a machine for crushing olives, and in Y was the press for extracting the oil. In P were the wine-presses, and in R were the earthenware casks in which the wine was fermented and stored.

As I have already mentioned, this villa contained the bronze specimens which I purpose illustrating as well as a large number of silver, terra-cotta and even glass articles. The most important discovery, however, was made in one of the pits beneath the floor space of the wine-press room. Here the skeleton of a man was found, with his face against the bottom of the pit In his hands he clutched a pair of gold bracelets and a gold neck chain, while about him lay the contents of his purse, upwards of 1,000 gold coins, together with 117 pieces of silver-ware which he had carried wrapped in a cloth or sack. This is the famous Treasure of Borcoreale, the greater part of which was purchased by Baron Edmond de Rothschild and presented to the Museum of the Louvre in Paris. Other villas have been unearthed at this village. Some wall paintings of great interest and importance, taken from one discovered in 1900 are in the Metropolitan Museum in New York while some fine vases were delivered to a museum in Berlin.

Pages might be written on the subject but for fear that it will not be of sufficient interest to readers of around ry publication I will not give it any further space at present. In subsequent issues I will illustrate and describe the bronze furnishings of which I have spoken and which I would have described in this article had I not feared to weary the reader. Suffice it to say the bronze bath tubs were of similar design to those used to day, with handles which hung down but could be raised to a horizontal but no further. The birds and beasts which adorned some of the articles were as natural as life, while the chains which formed part of the hanging lamp fixtures are a novelty.

I might also say that some iron farming tools were found but not in a very good state of preservation but they demonstrate the fact that iron was used that long ago if not as far back in ancient history as copper and bronze. Of course eighteen hundred years ago is not long ago when we are referring to real ancient history, but it is quite a while ago and if I had not seen the things myself it would be hard to believe that an iron sickle of the same design as a modern sickle still had a portion of the wooden handle attached to it. It must not be supposed that the houses were fillled with lava as some people think they were. As a matter of fact there was no lava came from Vesuvius in the eruption of 79. It was simply an explosion which took place, blowing several hundred feet off the top of the mountain and depositing it on top of such towns as were nearest, while those which were more distant were covered with ashes and dust. From this it will be seen that unless the building was crushed, very little would get inside of it and the furnishings would be fairly well preserved. But so long a time could not help but tell on even the bronze castings which were badly corroded, some being eaten right through.

STEEL FOR THE AUTOMOBILE

The automobile industry is without doubt, a specialised industry, and probably the highest form of engineering. To produce steel to meet these special conditions it is necessary for the firm producing the steel to have an intimate knowledge of the conditions prevailing in an automobile factory, and to be able to satisfy the purchaser, the operative, the heat-treating department, the metallurgist, and finally, the buyer of the car, as to the uniformity of his product.

It is well known that during the past 12 months a great deal of trouble and consequent loss of output has been experienced in the automobile industry, due to lack of uniformity of product in bright drawn bars of case-hardening mild and case-hardening nickel steels. This lack of uniformity has, in most cases been traced to the fact that a number of firms dealing in these so-called case-hardening steels have obtained their supplies from possibly half-a-dozen different steel firms and handed the steel on to the motor-car maker as their own product; some of the steel has been produced by the basic process, and some by the acid electric. A motor-car firm cannot possibly get the same result with these different steels. The inspection department rejects at least a small percentage of the finished parts, and if there is an "epidemic" of slag streaks, ghost-lines cracks, chipped, cracked or flaked cases, the general organization of the factory is seriously effected.

It is always well to remember that it is essential to have every part to complete any component. In other words, it is a poor argument, to say that you have 100 engines and cars ready for the road, but the engines are minus craft-shafts owing to flaws in the steel discovered during the grinding operation.

It is impossible to measure such a case in money as it completely disorganises the whole of the output. Imagine 100 engine testers awaiting engines to test—100 chassis testers awaiting chassis to test—100 body fitters, painters, upholsterers etc., awaiting these chassis 100 finished cars for finished test, and finally—100 clients awaiting delivery of the cars they have ordered.

All these troubles are thoroughly understood and appreciated by a steel firm which has made a study of, and knows the requirements and internal condition prevailing in motor car work.

A great deal of time, trouble and anxiety would be saved by the motor car concerns if this fact were properly digested.

MOLDINGS AND CASTINGS CHILLED FLOUR-MILL ROLLS

Continued from Page 21)

be recommended as it is apt to be high in sulphur which, while being hard has too many other qualities which are injurious. My experience has been that in making chilled rolls, the same as in every thing else the foundryman must use his head.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

Question—I enclose a small clasp in two parts, please advise me how to get a good lustre on goods of this kind.

Answer—The brass piece may be very highly polished by tumbling with leather meal in a horizontal wooden tumbling barrel. One operation should suffice. Use leather meal, and rouge mixed with wood alcohol. If one operation does not prove sufficient to give good color use the leather meal and very fine pumice or tripoli and a little coal oil for first tumbling. Use the fine pumice sparingly and fill barrel at least four fifths full, rotate at from 40 to 60 R. P. M. Several hours may be necessary to produce good finish.

The form om the steel piece is such that the use of leather meal would probably prove troublesome, as the meal would pack beneath the pointed portion and prevent the surface from being polished. Therefore very small steel balls, say 1/16 inch or smaller would be preferable.

The steel balls are used in a wooden barrel or a wood lined steel barrel rotated in a horiontal position and the bulk of balls should exceed the bulk of clasps. Then add dry fine Tripoli or pumice, cover with water and add ½ pint of soft soap. This treatment would naturally remove the blue color, if blue color was desired more brilliant, it would be advisable to use the leather meal and crocus powder or rouge and with small quantity of Cocoa Butter instead of wood alcohol as mentioned for brass piece. The dry method would be preferable if the steel piece is to remain blue or unprotected by subsequent coating of some kind, as the shape of the piece is such as to make it difficult to dry properly when handled in large quantities. Tumbling barrels of small diameter would be preferable unless the amount treated each time warranted large sized barrel as the load and speed of rotation are important.

Question—For several weeks past the factory manager has reduced the amount of cyanide and other supplies which may be ordered weekly from warehouse. During this period the quantity of work treated by our cyanide copper solutions has not decreased appreciably. The result has been troublesome to the plating staff by reason of solutions becoming depleted of free cyanide and causing blisters. What would you advise me to do? I have charge of the plating, subject to manager's orders.

Answer—Have a real serious heart to heart talk with the manager when he is in a happy frame of mind. Do not attempt it when he is busy. Explain in simple, brief terms the exact condition of the plating bath and why such conditions prevail. If he is a broad-minded fellow of even ordinary intelligence he will grasp the idea at once and loosen up on the weekly allowance of cyanide. In the meantime operate the copper solution with as low current density as possible. High current densities and insufficient free cyanide form a combination which favors blisters even on very clean surfaces. The grain of deposit is coarse and the color usually dark and dull. A very small amount of sodium carbonate might help you keep the cyanide consumption at a very low figure. Be careful in adding the soda. Large quantities are harmful. Dissolve the crystals in hot water or a portion of the solution before adding to plating solution in tank. Furthermore, less trouble from blisters will be encountered if copper solution is operated weak, say about 3 degrees or 4 degrees Be.

Question—Kindly tell me some of the advantages of a hot nickel solution? Is a special formula necessary when making a nickel solution, which is to be used hot?

Answer—Hot nickel solutions will conduct more electric current than cold nickel solutions and therefore deposit metal more rapidly. Hot nickel solutions may safely be credited with forty per cent. more efficiency than cold solutions. Furthermore, the deposited nickel is softer, finer grained, less liable to peel, chip or pit. One disadvantage is a reduction in throwing power when the nickel solution is heated to more than 100 degrees Fahr. On plain surfaces the temperature of solution may be 160 to 180 degrees Fahr., with splendid results. If work has cavities into which the nickel must be thrown, then, cooler solutions are advised. With the higher temperatures it is practical to employ considerable higher voltage to boost the ampheres than when only moderate temperatures are used. No special formula is required for nickel solutions operated hot. The principal object of operating the solutions hot is to facilitate rapid deposition of metal and in order to obtain maximum speed the nickel solution is usually made rather dense so that high current densities may safely be employed. Nickel solutions of low density will naturally limit the speed of deposition to lower figure than highly concentrated solutions. To be continuously effective the solution should contain a corrosive salt which will attack the anodes. Hot nickel solutions usually deposit darker colored coatings than cold solutions, and for this reason are not well adapted for use on surfaces with matte finish.

Question—Do you consider it bad practice to use the electric cleaner for cleaning polishing greases from surfaces of metals which are softer than copper? We have used the electric method for cleaning aluminum, lead and tin. We have had very little trouble until recently and we suspect the action has been too strong.

Answer—The electric cleaning method may be used successfully in cleaning all soft metals if the nature of the grease is such as to allow only weak solutions to be used at low temperature, or the period of treatment in the electric cleaner be only momentary. If a soluble oil is employed in connection with usual compounds used in polishing, the compound should be easily removed in mild alkaline solution and a very brief electric cleaning treatment successfully finish the operation.

Question—Our nickel-plating tanks are twenty-four inches deep, inside measurement. The pieces which we plate are arranged on holders which are about thirty-two inches long, twelve inches of holder being above the solution. The lower end of bottom piece as arranged on the holder is about one-half inch above lower end of holder. I have noticed that these lower pieces are often rough, sometimes burnt or chipped and seldom perfect in appearance when removed from the solution; worst effects are usually during afternoon runs. The man doing our plating tells us that the only remedy is to install deeper tanks. We do not wish to do this if there is any practical method of avoiding it. Any information you may furnish us will be appreciated.

Answer—There should be no necessity for installation of larger tanks in your case. Take ⅞-inch strips of wood on top of the tank and rest the rods on the strip. Fill the tank to within at least two inches of the top of tank, (not the strip). This gives you a solution depth of about two inches more than you now have. Why do you use such long ends on holders? Twelve inches is too much. Reduce the end of holder used for handle to not more than four or five inches, usually three inches will suffice; lower the rods on tank so that they lie in grooves made in the strip on top of tank. The holder should be constructed so that the space between pieces to be plated is approximately one inch. This permits ample volume of solution to surround the work. Clean the tank and the solution of all sediment and in future it may be advisable to remove slime from bottom of tank more frequently than you have in the past. Once every six months should be sufficient if the solution is used with an acidity strong enough to prevent ex-

treme turbid condition caused by iron oxide suspended in the solution. If the lower pieces continue to be defective after you have increased the depth of solution to the full limits of the tank and shortened the holders to reasonable length, we can only suggest that you reduce the number of pieces on each holder by the number plated on lower arms of the holder. We have known many cases where the plater has been quite confident that he was plating all the work possible each load, and eventually increased the surface area per load from one-seventh to one-third more by designing new holders capable of carrying greater number of pieces. Sometimes it is necessary to raise the cathode rods on blocks in order to plate work properly on certain holders. The anode rod should not be disturbed. Anodes two inches shorter than the average cathode aid in preventing over nickeling on lower ends. Connect the negative tank rod to bus bar by flexible cable to facilitate raising the rods for any purpose. In a tank 24 inches deep you should be able to plate cathodes at least 18 inches long. Do not remove the holders from the solution with a jerk or in a manner favoring the removal of unnecessary quantity of solution, careless handling of the work entering the tank or being removed from it will very quickly cause the tank and whole department to acquire an appearance which is very distasteful to the eye of any practical person, and increases the chances of failure when you have conditions such as you mention to contend with. If iron oxide causes you much trouble try dissolving a few ounces of citric acid crystals in hot water and adding very small quantities to the solution occasionally. It will clear the solution and prevent the mottled surface on deposits caused by small floating particles of iron oxide.

KEEP YOUR FOUNDRY WALLS WHITEWASHED

Light, Heat and Sanitation are three subjects which we have set aside as among the most important to be dealt with in connection with operating a foundry. The last two are not difficult to overcome, neither is the first one but it is the one which is frequently overlooked. Washing the windows is some help but if the blackened walls of the foundry are periodically kalsomined or whitewashed it is surprising how it reflects the light into every nook and corner of the foundry as well as making it lighter all over the room. It not only makes it brighter and more cheerful for the men but it removes the foul smokey smell which hangs about the foundry and which is so obnoxions to the nostrils. The employer must acknowledge the necessity of modernizing his plant and this is one of the points where he can find a opening to begin at. It is not necessary to go over the walls with a white wash brush, since spraying machines adapted to this very purpose are on the market and will cover a large surface in a short time. In the illustration will be seen one of these sprayers

Whitewashing foundry walls with force pump sprayer.

showing how the man holds the sprayer in one hand and runs the pump with the other. This type is known as the "Paragon" and is manufactured by the Campbell—Hausfeld Co., of Harrison, Ohio, and will cover one hundred square feet of wall a minute. This sprayer has a circular automatic, self-cleaning strainer which fits snugly over the end of the suction pipe, and through which all liquids must pass before they enter the

Type of force pump used.

pump. The agitator passes up and down over this strainer, scraping its entire surface with each stroke of the pump, detaching all sediment which the suction draws to its surface, thus keeping the strainer open and effectually preventing it from clogging. Literature covering these goods will be mailed for the asking.

BRIGE COMPANY CHANGES NAME

The Canadian. Chicago Bridge and Iron Company, of Bridgeburg, Ontario, and Montreal, Quebec, has changed its corporate name to Horton Steel Works, Limited, according to an announcement made by C. H. Scheman, general manager of the company.

The new name has been selected in honor of the late Horace E, Horton, who founded the organization in the United States in 1865. The Canadian organization was first incorporated in 1913 and the plant at Bridgeburg, Ontario, was constructed in that year.

Mr. Horton was one of the pioneer engineers of North America. Starting with a timber bridge at Orinoco, Minnesota, in 1865, Mr. Horton developed a large business in the design, fabrication and erection of bridges, steel tanks, etc. In the early nineties, he revolutionized the steel tank business by inventing the hemispherical-bottom elevated steel tank of which thousands are now in use throughout the world. A few years ago his son, Mr. George T. Horton, now president of the Horton Steel Works, Limited, invented the elliptical bottom tank with riveted steel riser which was a further advance in the art of steel tank building.

The corporation has supplied the railroads and many industrial organizations of Canada with plate metal products. The company has a tried organization with its own operating officials, a complete plant, erection forces and contracting organization. In addition to Mr. Scheman, Mr. G. S. Sangdahl is district sales manager at Montreal, Mr. C. C. Gregory is manager of plant, and Mr. F. E. Gregory superintendent of erection. The main office and works are at Bridgeburg, Ontario.

A NEW FOUNDRY FOR WALKERTON

The Napier Foundry is a new industrf which has just opened up at Walkerton, Ont., by Mr. U. H. Mortimer a practical mechanic who has just recently come to Canada from Great Britain. Previous to coming to Canada, Mr, Mortimer held the position of leading moulder with the Birmingham Phosphor-Bronze Co., for one and one half years, foreman for The Electric Tramway Equipment Co., of Birmingham, 4 years, foreman at Waygoods Hydraulic Lift and Crane Makers, Coventry 2 years. His specialties here, will be brass, bronze and aluminum castings for electrical, engineering, and marine purposes, also aluminum match plates and patterns for foundry use.

Foundry is Rebuilt:—The entire plant of La Compagnie Des Jardines, St. Andre, Kamouraska County, Quebec was destroyed by fire May 31. Immediate steps were taken to rebuild and the new foundry has just been put into commission. The machine shop is well under way and it is expected that this department will be in operation before the end of August. The company manufacture a line or Threshing machine engines and other farming machinery as well as grey and malleable iron castings.

Another Demonstration of Canada's Progress

After many years of Comparative quiet Canada has awakened to a realization of her position in the World. One of her industries.

OF RECENT years Canada has been developing along lines hitherto considered beyond her reach ubt each stride convinces not only the Canadians but those of all nations that Canada is becoming a nation to be reckoned with.

From the standpoint of natural resources it has always been known that we possessed an enviable share, but our extreme modesty and lack of self esteem has prevented us from making much use of them, or would it not be more fitting to say that the lack of gumption on the part of our immediate forefathers stood in the way of our natural resources being developed to the advantage of our people.

It has always been a strange trait of the Canadians to want outside capital and outside brains to do all our developing. The recent print paper fracas showed us that our pulp wood forests were the reserves on which outside publishing houses depended for their supply of paper, but it also showed us that while these reserves are within our border and under our flag they do not belong to us. This, of course, is only true of certain sections.

We still have lots of pulp wood which has not been thrown away, and we have the natural water power and electric possibilities to develop it and work it up, not only into pulp, but into paper as well. Different concerns in Canada have for some time back been making pulp machinery, but the machinery for making the paper has been for the most part, imported. The same might be said of the water wheels. Canadian institutions have been making turbines for year back, but not going extensively in to the larger sizes such as are now called for, but this also has been changed and some large contracts have been taken by Canadian establishments and delivered in a most satisfactory manner.

To meet the increasing demands for these large engineering contracts the Dominion Engineering Works, Limited, of Rockfield, Que., have recently extended their grey iron foundry, which at the present time is capable of taking care of work of every character from the smallest to the largest castings. Many one-piece castings weighing close to fifty tons have been successfully produced, and orders now in hand call for pieces that will approximate 60 tons in weight for one casting. The original foundry, which was about one-half the sizs of the present building, was opened about sixteen months ago, the first heat being run off on the 10th. of January 1920. At that time the castings produced were intended for paper making machinery and small turbines, but the activities of the company during the past year has expanded so that greater facilities were essential to meet the growing demands for larger and heavier castings..

Many of the castings required for water turbine work are of a most difficult character, and it is for this work that the foundry has been particularly organized. Such intricate castings as turbine runners, head covers and speed rings, require equipment and expert moulders not found in most foundries. The Dominion Engineering Works is now building turbines of the largest sizes yet built, as well as smaller wheels.

The foundry building, which is located at the eastern end of the general machine shop, and at right angles to it, has a total length of 346 feet, 6 inches, and a width of 145 feet, 6 inches the width being divided into three sections, two side portions of 30 feet width, and the center section, where the heavier work is prepared, having a width of 85 feet 6 inches throughout the entire length. The height from the floor to the central roof truss is 41 feet, while each side section has 24 feet 6 inches clear below the roof supports. The side farthest removed from the main shop for a length of 180 feet is reserved for the blower room, cupolas, core drying ovens, sand mixer, etc., while the charging floor extends above. The total foundry floor space is approximately 29,400 square feet, and that available for moulding purposes is close to 28,000 square feet, divided into a number of sections of different size, each division intended for different classes of work. The main floor is served by three cranes of 70 tons, 35 tons, and 15 tons capacity, travelling throughout the entire length.

For the productions of the large paper making machines pits were necessary for the making of the large drying rolls on each. Two of these pits have been provided, one having a diameter of 12 feet 9 inches and 16 feet deep while the other has a diameter of 9 feet 4 inches by 12 feet deep, both being lined with steel plate, and located at the north end of the foundry. In addition to these pits being used for the moulding of long drums they were also utilized for the making of the built-up cores. Adjoining these pits are special core ovens in which the prepared cores for the dryer rolls are placed on end. This section of the shop is also provided with two wall jib cranes of 3 and 5 ton capacity. Directly opposite the cupolas and about the center of the main floor is a 72 inch by 72 inch pneumatic jolt ramming machine. This is conveniently located for serving both the main floor and the side section.

At the west end of the main floor are located the concrete pits for casting the large water wheel and generator sections. Five of these pits are of uniform size, 30 feet by 16 feet, while one on the end for very large work is 34 feet by 30 feet, the depth of 12 feet being common to all. The reinforced walls are 18 inches thick. For mould preparation and the setting of cores, a five-ton Dominion Bridge gantry crane straddles the pits and travels over the entire six. For the removal of the finished castings the large travelling crane is used. Some of the work is shown in the accompanying views.

The cupolas, three in number, are located about midway of the length and directly opposite the entrance to the machine shop. The cupolas are 37 inches, 54 inches, and 84 inches in diameter respectively, with capacities of 7½ tons, 15 tons, and 25 tons of iron per hour, and were built by the Dominion Bridge Co. Three blower units, with capacities of 13 cubic feet, 24 cubic feet, and 81 cubic feet of free air per minute are provided, and they are so arranged that any one of the three may be used for any cupola. This is one of the best features in the entire plant, and one which is too frequently overlooked.

Directly above and adjoining the cupola section is the charging floor which has storage facilities for 100 tons of material. On the same level as the charging floor and extending out over the material stores section are two loading platforms, each 16 feet 6 inches in width, and with a length of 21 feet, half of which protrudes outside the building. The material storage space occupies about 35,000 square feet. The coke, scrap and pig iron, from the yard is loaded into skips handled by a 15 ton bridge crane operating over the entire yard. When the skips are brought to the loading platform the material is loaded into buggies with the proper proportion of each material, and weighed before going to the cupolas. Foundry sand is also delivered in this way and dumped into the mixer located below the charging platform.

At the south end of the foundry is the flask storage yard, where heavy flasks and moulding plates are kept. An interesting feature in regard to wall construction is shown at this end, where the brickwork is only built part way up to facilitate the handling of the large flasks to and from the foundry. The crane runways extend out over the storage yard so that the crane can run past the wall without trouble, the hanging material entering through the large central swinging doors. Overhead doors are provided for closing the space above the partial wall, but during the summer months it is left open, thus giving maximum ventilation for gases, etc.

The roof over the casting pit is of

concrete, this doing away with the necessity of sprinklers, but the latter are provided in all other sections of the plant. Between the foundry and the machine shop is a space 41 feet wide and 347 feet in length, where the cleaning room is located, together with a general storage bay for finished castings before the same are delivered to

Specimen Castings, Molds and Equipment Dominion Engineering Works, Ltd., Rockfield, Que.

E-46—Half of head cover for twenty thousand horse power turbine water wheel. E-70—Half of speed ring....E-50—Core work for speed ring. E-112—Cupolas such as are required for pouring this size of casting. E-9—Equipment for making large paper machine rolls. E-16—Jolt machine and other foundry appliances. E-42—Loam molding floor. E-118—Casting pits and molds for heavy work.

the machine shop. This section is served by a 40-ton travelling crane.

Standing gage railway tracks are laid directly into the shop and this assures economic handling of all material and heavy castings. Convenient track scales are located in different parts of the shop. The smaller castings are cleaned by a Pangborn sand blast, while the larger ones are handled with a wire brush.

Every attention has been given to the welfare of the workmen; a large locker room has been provided with wash basins, where the men may clean up and change their clothes.

On the whole, it must be admitted that this plant compares favorably with those of any country and speaks well for Canadian ambition and confidence in Canada's future.

In the illustrations will be seen some views of the interior of the foundry, showing the style of work being done, the method of doing it, and the facilities at the disposal of the men for accomplishing the same. The one marked E-46 is half of a head cover for a twenty thousand horse power turbine water wheel. Compared with the gentleman who stands beside it, and who by the way is Mr. Cahill, the foundry superintendent, it is a fair sized piece of casting. In the rear of this casting and in line with where Mr. Cahill is standing will be seen a grab bucket which was not mentioned in the list of equipment. This is just an incidental which is expected to be found in a plant of this kind. Pits are not filled nor emptied these days with a hand-operated shovel.

Another good sized casting is shown in E-70. This is half of a speed ring and makes a better showing than the other in comparison with the workman who stands in front of it. E-50 shows a commencement being made on the mould for the speed ring just mentioned. E-42 is a typical loam moulding floor, while E-118 shows the large casting pits, and the moulds in various stages of completion for the large turbine castings. E-9 is a view of the north end of the foundry showing pits and the round sectional flasks used for moulding and casting the long paper mill drying rolls which are poured on end in these pits. E-16 is a general view of the foundry interior, showing the jolt ramming machine in the middle of the floor and the drying ovens in the rear. E-117 shows the battery of cupolas with a combined capacity of 47½ tons per hour.

World War Reviewed

Captain Thomas G. Frothingham's book, "A Guide To The Military History Of The World War," has been issued in the States, and has aroused a great deal of interest. Admiral Sir Crypian A. C. Bridge of the British Navy has written to the author saying: "Your criticism of the Battle of Jutland is without exception the most valuable that I have seen. It is especially thoughtful, candid and impartial." T. Fisher Unwin, Ltd., published the book on June 15.

GRAPHITE, A PRODUCT IN WHICH CANADA LEADS

Graphite and Plumbago, are to all intents and purposes one and the same thing. They are frequently spoken of as black lead but they are in reality no way connected with mineral lead. Lead is among the heaviest of metals while graphite is very light and when in the form of dust will float on the surface of water. It has some of the appearances of lead, however, hence its name. One of its chief uses is for foundry facings, usually being known as pure Ceylon plumbago notwithstanding the fact that Canada supplies the United States and Canada with mostly all that is used. Besides its uses as facing for moulds, many other uses have been found for it. A few words regarding graphite will be of interest.

Although graphite enters either directly or indirectly into practically every sphere of the handiwork of mankind, outside of technical circles it has remained, until the last few years, comparatively unknown. This is all the more surprising when one considers its diverse uses. The long list includes—The crucible for the manufacture of steel and the refining of metals of all kinds, castings of every description, lubricants, pencils, stove polishes, weather proof paints, fillers for electrical batteries, electrodes, electrotypers' leads, pipe compounds glazing explosives, minimizing water friction on launch and ship bottoms, treatment of boiler scales, etc., etc.

The mineral graphite (from the Greek "Grapho," to write) is found in two distinct forms—crystalline and amorphous, and one should not be confused with the other.

Crystalline Graphite has a live, bright, dark grey color and possesses high lubricating and refractory properties. It is soft and unctous to the touch and has the lowest co-efficient of friction and lineal expansion of any known solid.

Amorphous graphite has a dull dead black color and more approaches a shale or the true coal series, and, like coal, is probably of organic origin. It has not the high lubricating or refractory properties of crystalline.

Each form has its uses.

Graphite is a generic word like coal or oil, that is, it stands for a vast variety of different kinds and grades which may only be used for their own particular purpose if their peculiar properties are to be utilized.

Thus, one could not use, with advantage, brown coal where anthracite coal is suitable, neither could one expect much success from using burning oil for lubricating purposes.

In the same manner graphite used for making crucibles would not suit battery makers' requirements and that prepared for paints would be of little value as a lubricant.

As a lubricant the crystalline flake variety is conceded to be preeminently more suitable, and, provided it is properly refined, either in its flake form or ground to a powder, it stands unsurpassed for this purpose.

In order that the value of graphite may be clearly and logically explained, a few words on the theory of lubrication may be helpful.

It is mechanically impossible to obtain a perfectly true surface. However smooth a surface may appear to the touch or naked eye, the microscope reveals innumerable pores, eruptions and irregularities.

Friction is caused by the rubbing together of these surfaces in contact with each other, the interlocking and grinding away of the irregularities.

Friction is wear with consequent deterioration and loss of power.

Friction takes a heavy toll from all machinery uses. Even in plants where the strictest attention it given to lubrication, as much as 40 per cent of the power is lost in the transmission from the generating source to the place of service.

This means that in a plant employing a prime mover developing 2,000 H. P. only 1,200 H. P. are exerted in the direction for which they are generated, the balance of 800 H. P. being absorbed by frictional actions in transmissions, bearings shaftings, etc. To this serious loss must also be added the cost of wear and tear which this friction entails.

The object of lubrication is to reduce or minimize this friction.

Lubricants are divided into three main classes—Fluid or oil lubricants, pasty or grease lubricants, and solid or dry lubricants. Of the last class graphite is the most efficient.

Oil or grease is used to form a film of varying thickness between the metallic surfaces and the ideal is attained when this film is thick enough to prevent these surfaces coming into contact with each other. A certain degree of efficient lubrication is achieved so long as this thin film is maintained, but a greater efficiency is obtained by the addition of the right kind of graphite to these lubricants.

Graphite functions in a manner peculiar to itself. When introduced it readily adheres to the surfaces in bearing contact and permanently fills up the pores and irregularities until an entirely new surface is created of allotropic carbon or graphite which cannot be squeezed out even under the heaviest pressures.

The condition of the bearing surfaces now is that, instead of the rough metal faces, a durable graphite veneer has been produced, or in other words, the surfaces have become graficated, enabling the oil or grease to function with greater efficiency and economy.

This can be demonstrated by a very simple experiment. Take two pieces of ordinary letter paper and place one upon the other. Attempt to move one surface over the other, exerting force and pressure. It will be found that considerable friction is generated and that they

can only be moved with comparative difficulty. Now sprinkle a little "Graficant" between the surface and try again. It will be found that the more the "Graficant" is rubbed in, the easier it becomes to move the papers until they glide over each other smoothly—no matter how much pressure is exerted.

Graphite is not a competitor of oils and greases but is meant to co-operate with these lubricants.

Modern heavy and high speed machinery, also the universal use of the internal combustion engine, has called for very heavy and sustained service from lubricants.

Oils and greases have attained very high standards. It will be obvious, however, that just as there is friction with solids, there are degrees of friction with liquids or semi liquids varying in ratio to their viscosity. A thick oil offers more resistance to movement and pressure than a thin oil for example. The higher the viscosity, the higher the internal friction. Internal friction in the lubricating film must be considered when assessing the total frictional resistance in a bearing. It is possible to increase the friction load of a bearing 25 per cent by increasing the viscosity of a lubricant.

It follows therefore, that if the viscosity and quantity of an oil can be reduced, greater efficiency can be obtained.

Bearings can be run which have been graficated with just sufficient oil to maintain a thin film instead of having to feed volumes.

As we have before mentioned, the graphite for this purpose must be the right kind.

This is the result of many years of experience and the scientific treatment of flake graphite mined by ourselves from deposits considered by geological and mineral experts to be one of the highest known forms of crystalline flake graphite at present known.

It should be free from grit or other abrasive or harmful impurities.

It should be free from grit or other of any known acid, alkali or gas.

It should remain unaffected by intense heats, extreme cold or rapid changes of temperature.

It should be tough and pliable and able to stand the greatest pressure without losing its lubricating properties. The flakes should lock themselves into the interstices of the bearing surfaces and not be squeezed out.

Should reduce seizing or cutting actions and reduce the wearing of bearings to a minimum.

It can be used in bearings where, on account of heated or alkaline conditions, oils or grease would be useless.

It is invaluable in all bearings which call for heavy and sustained service from a lubricant.

It is impervious to weathering action.

First of all, do not use too much—it is only wasted. It is not practicable to lay down arbitrary proportions, but generally speaking 5 per cent added to oils or greases is ample. Some bearings require more than others, depending upon the conditions under which they are working and the service they are called upon to give. The right proportion can be speedily found and it should be fed in with every new supply of oil or grease.

It is generally used dry in the lace making and some textile industries where oil would injure the cambrics, also in many bottle making and chocolate factories.

It can also be used with water where conditions render this necessary.

For cylinder lubrication of steam engines it is more practicable to feed the dry Graphite by means of one of the many lubricators sold for this purpose. For cylinder lubrication of automobiles allow a little to be inhaled through the air intake of the carburetor every now and again.

It improves compression and thus adds power. It will not clog and it prevents valves and rings sticking. Do not use too much—in automobiles a little every 500 miles is ample.

Add in proportion of 5 per cent to oils and greases for lubrication of gears, chains springs, etc.

Invaluable for all bearing surfaces in:

Automobiles, Steam, Gas and Oil Engines.
Mining and Milling Machinery.
Hoists
Steam, Air and Electric Drills.
Agricultural Machinery.
Pumps.
Chains and Sprockets.
Transmissions.
Cables and ropes.
Elevator Slides.
Springs.
Valves.
Compressors.
Marine Engines.
Wooden Surfaces in Sliding Contact, etc.

Large Flake for general use where heavy service is required, such as heavy bearings, loose or rattling auto bearings, spur wheels and pinions for crushing and milling machinery, etc.

Fine Flake. Ideal for close fitting bearings, automobiles, and light machinery.

Used Like Red Lead But Instead Of Red Lead

A red lead joint becomes hard and set after it has been made and requires a considerable amount of force to unmake it, and more often than not the joint or fitting is strained or broken and damage done to the tools and tongs.

By the use of "Q" Brand Graphite Pipe Joint Compound a perfectly sealed and highly lubricated joint is obtained that is easily made or unmade even after years have elapsed. The graphite being inert cannot set. It remains unaffected by the greatest heat possible for a joint to be subjected to, while the extremest cold leaves it unaltered. It absolutely prevents rusting. Owing to its greater bulk and smearing qualities it is more economical than red lead, and it is thus possible to make many more joints with the same quantity.

Invaluable for Joints Which Have To Be Often Made and Unmade

Gaskets fitted with red lead or similar harding compounds cannot be taken off without being damaged and in most cases rendered useless for further service. When sealed with "Q" Brand Graphite Pipe Joint Compound Gaskets can be removed with ease at any time without injury, thus saving time, labor and material.

For all steam, water, gas or air joints, bolts and nuts, threads, cylinder heads, manhole covers, boiler ports, etc., etc.

Ideal for automatic spark plug threads and other connections that have to be constantly unscrewed, and which are subjected to intense heat.

WELDING BASE OF 250-TON HYDRAULIC PRESS.

A typical instance of the practical application of oxy-acetylene welding in repair and maintenance of plant equipment is that of welding the base of a 250-ton hydrolic press that was badly broken in service.

The heavy base was broken entirely through, the fracture extending diagonally across the center. To properly bring the parts together for welding, it was necessary to bind them with a chain and supplement this with a steel plate securely bolted to the uprights.

The necessary chamfering was done to secure penetration and proper bonding throughout the joint, and an improvised preheating furnace was then built up of "I" beams and loose brick. Approximately 125 pounds of charcoal and 200 pounds of asbestos paper for covering were used.

When the base was brought to proper heat, openings were made in the asbestos sheeting to afford access to the work in operating the torches and filling rods, and the actual welding was begun. After the work has progressed to a point where the girding interfered with the operators, the chain was removed, the steel plate being then sufficient to keep the parts properly aligned. There were 44 inches of linear welds (4½ inches deep), besides an area of 8 in. × 4½ in. that was missing and had to be built up. After welding the entire base was allowed to cool slowly in the furnace.

The job was handled throughout by two operators, using No. 4 Oxweld blowpipes with No. 15 tips. Approximately 250 pounds of cast iron alloy rods were used for filling.

To have obtained a new casting would have cost the owner $800 and a delay of several months. The repair cost but a small fraction of this amount, was accomplished in a few days, and the machine was again in operation within a week from the time it was sent to the welding shop.

Various Plans to Improve Industrial Relations

In Introducing Plans of Industrial Relations, It is Necessary to Overcome the Mutual Distrust Which Usually Exists Between Employer and Employee

By RAY VANCE

THE title of this paper is so broad that it might be considered as covering every form of contract between employer and employee. However, to restrict the discussion to the limits desired, we must consider only those definite plans by which employers have sought to obtain such a co-operative understanding with their employees as would bring about a voluntary increase of production on their part, while at the same time giving them more pleasant working conditions and larger financial returns.

Nothing could more certainly destroy the practical value of this study than to approach these plans of industrial relationship in a mental attitude of criticizing their abstract principles. We must fix firmly in our minds the fact that industrial co-operation, while enthusiastically supported by a very large section of the industrial world, is decidedly on trial with another very important fraction of both employers and employees. Therefore, the plans must be considered not so much in the light of theoretical perfection as in the light of the every day conditions out of which they have grown. In other words, the plans are not models of theoretical perfection made outside and imposed upon the industries where they exist, but are the result of consultation, co-operation and compromise, to make them workable by the human elements already found within the industry.

Human Elements Involved

When we spread out a picture of these human elements, we must naturally consider the employer first, for it is from the employer that most of the initiative in such plans has come. Some employers have entered into their plans for industrial relationship with the broad realization that under-production is the most fundamental of all causes of poverty, because no system of dividing the product of industry between employer and employee can avoid being limited by the amount and quality of product which is to be distributed. You cannot divide something which is not in existence. Therefore, they have realized that the first step is to secure either more intense or more intelligent effort on the part of the actual producers, so that the goods to be divided may be plentiful enough to permit a really increased standard of living on the part of the producer. Such men frequently have regarded themselves merely as the leaders of their employees, rather than as capitalists, and have kept the motive of personal profit in the background.

Others—and I frankly believe a far greater number—have simply seen the proposition in this light. There is between the quantity and quality of output of indifferent, uninterested labor on the one hand, and that of active intelligent labor on the other hand, a margin sufficiently wide to bring the employee a new standard of living, and at the same time to offer capital most exceptional profits. The motive here has been different, but the working method and results very nearly the safe.

There exists, however, still a third class of employers who have been without much real belief in the efficacy of industrial relations plans, but who in spite of this lack of confidence, have installed such plans in much the same spirit that a shipwrecked sailor steps out of his small boat into a band of South Sea Islanders. He feels sure that he cannot be any worse off than he has been under the prevailing conditions. He hopes for the best, but keeps one eye open for signs of cannibalism, and if he has a gun in his possession is likely to have one hand on that.

When an employer of any one of these three types has decided to enter a plan of industrial relations with his employes much less than half of the total opposition has been overcome, for, when the employe is met, the one dominant mental reaction is suspicion. High guaranteed wages, a greater number of hours totally free from work, or guarantees that the men need not do more than a certain fixed limited task within any working day are things which the employes understand and appreciate. But such phrases as "going into partnership with the boss" mean to them "speeding up" and a whole train of other bogies which they have been taught to fear.

If we were asked to consider the theoretical probabilities of introducing successful plans of co-operation into a labor situation such as has existed in the United States during the past four or five years, we might well be justified in deciding that the best of plans would be wrecked upon the suspicion existing among the men who must voluntarily accept them if they are to be successful. The plans which actually have been put to work and which we are considering in this paper, are ones which have surmounted that obstacle. That is why we must consider them in the light of conditions out of which they have grown, rather than in the light of any preconceived theories as to just what such relations ought to be.

The two most dominant conditions which industrial relation plans have faced at the outset, have been a tendency toward mutual distrust between the employer and the employe on the one hand, and on the other hand, the unescapable necessity of having more efficient production precede in point of time any increase of distribution. The realization of these two circumstances gives us the primary key to a study of the broad principles which underlie the seemingly endless variety of industrial relation plans now in existence.

The most obvious and apparently the earliest method of solving this difficulty was to devise some scheme by which it was not necessary to "sell the plan" to employes until after it had been demonstrated in actual practice. In this group belong those plans for industrial relations which involve profit sharing as a voluntary reward from the management, without any contract specifications except those of the ordinary terms of employment. The advantages of this scheme are:

1. It is put into actual effect without demanding a definite assent from all of the employes, or for that matter any definite assent from any single individual employe. As a matter of psychology, it is true that a man sometimes will give a real trial to such a scheme in his daily efforts, when he would absolutely balk at giving it a definite public recognition.

2. This gave to the management an opportunity to demonstrate at the end of the profit sharing period., the fact that they were honest in their promise to share profits, and were not attempting to speed up their employes through deceptive promises.

The following weaknesses of this type of plan have developed:

1. The employe has failed to recognize any responsibility for the success or failure of the plan in whose adoption he has had no active part.

2. The connection between any increased efficiency on the part of employe and the benefit which comes to him from the plan is indirect. The average employe, particularly in one of the larger plants, is able to see very little connection between his personal efforts and the net profits of the corporation. In fact, he is apt to regard the bonus or the profit sharing payment as an arbitrary sum, fixed by the whim of the management, and, particularly in years of small profit, is likely to feel himself a victim of either greed or blundering on the part of the management, so that in the end such a plan has been judged by some of its users to create a worse feeling between employer

and employe than existed before the plan went into effect.

3. The length of time likely to intervene between bonus or profit sharing payments is so long that the employe loses interest in the meantime. When he does receive it he is likely not to regard it as part of his regular income, but to use it in a spending spree, or to lose it in unwise speculation, so that neither his regular standard of living nor his saving account are improved.

Stock Selling Plans

In order to meet the weaknesses of the profit sharing scheme, two different policies have been followed by the older plans of industrial relations. One of these plans which has had a very wide use during the past 20 years is that of selling stock to employes, usually somewhat below the market price and always on easy terms of payment, arranged through the employing corporation. This plan naturally requires the assent of all employees who get any benefit from it, since the purchase of the stock requires affirmative action on the part of the employe himself. However, it has the advantage that it can be applied to any one employe without the assent of other workers, and in theory at least, each employe who decides to participate becomes an active partner in the enterprise itself. If the corporation is a firmly established one, the employe is provided with an automatic method of accumulating a savings account, which makes him a more self respecting citizen, and usually from that very fact, a more valuable workman. This plan retains, however, the weaknsses of a very indirect connection between the employe's effort and the reward which he receives, and also the further weakness that the time intervening between payments is so long as to allow a considerable lapse in interest. Two additional weaknesses are developed in that the employe is rarely able to accumulate a sufficient number of shares of stock to make any very appreciable addition to his income, and in the second place, if the business is of speculative nature the employe may be led to take speculative chances beyond those which should be taken with his savings.

In the last analysis, the stock selling plan of industrial relationship finds its main weaknesses in the fact that it usually affects only a minority of employes, and that its effect upon them is in a much smaller degree than was hoped by most corporations at the time of its adoption. It has, however, been considered too valuable to drop by such concerns as the United States Steel Corp. and the International Harvester Co., and has been adopted more recently by other concerns such as the Larkin Co., after a detailed study of the field. So far as I have been able to determine, it is the only plan of industrial relations in general practice which makes definite provision to assist the employe in the accumulation of capital directly under his own ownership. For that reason alone it is worth serious consideration, and this phase has led a number of concerns which follow other plans of industrial relations within their plant to adopt the selling of their company's shares to employes as a supplementary activity.

Specific Bonus Plans

A much more direct way of meeting the objections to the ordinary bonus or profit sharing scheme is involved in those plans where bonuses are made directly dependent upon personal efforts of the employes. Specifically, this type of bonus may be based upon almost any item in which the individual employe raises his efficiency above the prevailing standard. In some industrial plants bonuses are given for extra quantity of work performed within a given space of time, but this one of the least frequent measures, and is condemned by many as tending to produce speed at the expense of quality. More common and more generally approved bases of bonus payments are: Regularity of attendance on work; length of service; high percentage of perfect production units turned out; saving of waste material, etc. This is not a complete list, but may be taken as a sample of how the employe renders himself a more efficient producer, and thereby directly connects his own voluntary efforts with the receipt of additional compensation.

This form of direct bonus for efficiency in work has the further advantage that it can be calculated over short periods so that the employe has before him a direct reward for his own effort with very little fear that his efforts will be nullified by others over whose efforts he has no control, and at the same time receive this extra compensation with sufficient frequency to keep the interest constantly in mind. In other words, by putting bonus payments on such a basis, we eliminate the weaknesses of the ordinary bonus system which arise from indirect connection between effort and reward, and from long periods between payments.

The plans which belong to this group are being applied to-day in at least hundreds and possibly in thousands of industrial and transportation companies, and it is worthy of note that where more complicated plans of industrial relations have recently been adopted, the elements of this relatively simple plan have usually been retained.

The Newer Plans

The plans covered up to this point all have two characteristics in common. First, they are adopted by the management; the employe adopts or rejects the plan as a whole. Second, the owners and managers of the business retain absolute control of all matters of business policy and of production plans.

We have noted how each of the plans of this type develop some strong points and some weak points, but in each case the effect of the plan on employes was far less than had been hoped. During the late war there arose two new groups of industrial relationship plans marked by a departure which may well be described as revolutionary. This departure involved the surrender by the management of a very considerable share in the actual distribution of production policies and in factory discipline.

The purpose of this revolutionary step is to meet the general weakness of lack of interest on the part of employes shown in the older plans of industrial relations. In studying the question I have found employers and employment managers with every shade of opinion, from most enthusiastic endorsement to the most bitter denunciation of this step, and shall make no attempt to introduce any controversial discussion as to its wisdom, but rather, confine myself to a description of how the basic principle has been applied in various plans.

Generally speaking, all the plans which involve some surrender of the power of the management to the rank and file of employes seem to group themselves under two heads:

1. Organizations which are called "industrial democracies."
2. The shop committee plan.

Industrial Democracy

So far, the industrial democracy systems are practically the work of one man, and therefore, present very little variation in type of organization. They are fully described in a book published by the author of this scheme, and I shall not attempt to reproduce that work here, but only to give a brief outline of what the plan entails.

In form, the organization is very close to that of the representative government maintained in England or in the United States, although not a strict parallel with either. The three functioning bodies are:

1. The Cabinet, which consists of the major executive officers of the company, who are absolutely the representatives of the owners of the business. They have the power of veto over all actions taken by employes' representatives, and may suggest to the employers' representatives, actions which they believe should be taken, but give up their power to frame and issue any order affecting the employes without the consent of the employes' representatives.

2. The Senate, which is also representative of the management, in that it is made up of minor executives department heads and foremen, appointed by the management rather than elected by the employe. This body has the right to initiate legislation regarding factory management, and passes upon all bills initiated by the employes' representatives before they go to the cabinet. Briefly stated, its powers are very similar to those of the senate in the United States government, but it should be noted that it differs in not being a directly elected body.

3. The House of Representatives is elected by direct secret ballot from the

entire body of workers. Some variations are introduced into the plan here, since each representative may stand for a department, a section, or any other group of workers, but the underlying object is to make them most fully and broadly representative of the rank and file of employes. This body may either initiate legislation itself, pass upon measures iniated by the senate, or take up suggestions made by the cabinet. Briefly, its direct object is to make every worker in the company, through his direct representative, a constructive and responsible unit, in the determination of factory and producing policies.

It will be noted that this plan carries with it the theoretical possibilities of an absolute deadlock on any policy. This might result in a strike, just as would the demand of union when refused by the management of any company. In other words, its success depends upon the ability of the different human elements involved to come to a compromise agreement. In none of the plans that I have seen, is there a provision for outside arbitration of such a dispute. Frankly, it still remains to be seen whether these plans will work out over a long period, but, up to date, I cannot find any instance where the plan once installed, has resulted in any deadlock requiring outside assistance to settle. In two cases, however, industrial democracy plans have been allowed to lapse.

It is necessary in every one of these plans of industrial democracy that there must be some method for allowing the employe to share in the savings introduced by his voluntary co-operation in better production. I cannot see that there is any reason why any one of the bonus or profit sharing schemes mentioned earlier in this paper could not be combined with the industrial democracy plan of factory organization, but the plans installed under this method have all used a form of bonus which is called the "collective economy dividend." This dividend is not based upon the specific efficiency shown by an individual, as so many of the direct bonus plans are, but rather upon the accomplishment of the factory employes as a whole, including the rank and file, foremen and executives. It is not, however, dependent upon the net profits of the corporation.

The basis of the economy dividend is the unit cost of production. Unit costs of some standard period (usually just before the plan is started) are taken as a standard, and the difference between these costs and those shown under the industrial democracy organization is considered as a collective saving, due to the co-operative efforts of the human factors in the production. Any saving made by the introduction of better machinery or better methods are included just the same as those due to more efficient use of time, for the object is to hire all the constructive brains of the employes, as well as their physical workmanship. When the collective saving has been determined, a dividend is made, one-half to capital and one-half to employes. This collective economy dividend is distributed at frequent intervals (usually two weeks) so that it carries all the benefits of constant interest on the part of the employes. It may be objected that the individual has not so great a reason for connecting this dividend with his own personal efficiency, as he has when a bonus for individual excellence is granted, but proponents of this plan argue that since each individual is able, through the house of representatives, to participate in the planning of policies and in the discipline under which all employes work, the connection is direct enough to answer the same purpose. It is further argued that the public opinion of the other employes will tend to exert pressure upon those few who might not be willing to give their very best efforts in order to earn an individual bonus.

Shop Committee Plans

The shop committee plans of industrial relationship are more numerous than industrial democracy plans, and, being the work of a great number of different authors, they present much wider variations. As a matter of fact, the line between company unions, employe brotherhoods, welfare societies, etc., on the one hand, and shop committees on the other hand, is not very definitely drawn. Many of the welfare organizations have gradually merged into real shop committees, and a very large percentage of the present day shop committees still function as welfare organizations, insurance societies, etc., or if created primarily for shop committees, have added those functions. However, the most generally accepted definition of a shop committee is "a group of company employes' and management's representatives (usually having an equal number of votes) meeting regularly or upon occasion, to settle joint problems."

The surrender of power by the management is a feature of these real shop committee systems. The most general provision for this surrender of power is the agreement by the management to carry out every policy which secures a unanimous vote in a joint meeting between their respresentatives and those of the employes. In each of the plans which I have studied, there is some provision made for an appeal where agreement cannot be reached in the first meeting. These appeals go upward until many of them end with a definite provision for carrying the case of disagreement to an outside board of arbitrators. In other words, they are intended to completely eliminate any chance for a disagreement ending in a strike. The attitude toward outside arbitration may well be illustrated by the fact that out of 20 plans specially studied, 10 provided definitely for outside arbitration. One provided for outside mediators, and nine left to ultimate settlement inside the company itself, as is done in the case of industrial democracy plans already described.

Because of this surrender of the power of management, employers entering into shop committee plans have usually demanded three safeguards for their interests:

1. Only employes who have worked a specified time (from three months upward) are allowed to vote on the plans.
2. The right to discharge employes for certain or specific offenses without reference to the shop committee has been reserved.
3. The right to terminate the plan upon some specific notice has been reserved in a few cases. It appears to be implied in those where it is not specifically mentioned.

These three safeguards are not universal in the plans, but I should judge from comment, that they are likely to become a working part of the vast majority.

Generally speaking, the shop committee plans have the same ultimate object as those of the industrial democracy plans. That is, to make every employe a responsible unit who has an officially recognized duty in promoting the efficiency of the plant in which he works. However, no definite profit sharing bonus or wage dividend plan can be regarded as an integral and necessary part of a shop committee plan. A large majority of the individual companies which maintain these shop committee plans do have with them some one of the forms of profit sharing bonuses or wage dividends described earlier in this paper, and in all cases whether a definite profit sharing bonus or wage dividend plan is in force or not, the subject of wages and methods of wage payments are among those covered by the shop committee machinery. The point to be emphasized here is that the shop committee plan, in itself, is absolutely distinct from any one of the wage payment methods, so that anyone considering the adoption of a full plan of industrial relationship, including both machinery for the employees' co-operation, and a method of insuring to the employee a just share of the savings or increased profits produced, will necessarily consider these things under two separate heads.

Summary

As a summary, it seems that the various plans of industrial relations can be taken under two heads:

1. Those older plans such as bonuses, stock selling plans and profit sharing schemes, which had for their object, securing more efficient cooperation from employes through offering financial rewards for efficiency, but did not in any definite way place responsibility upon the employe for production management policies
2. The newer plans are most largely concerned with placing definite responsibility upon the employe, and, in so doing, surrender part of the power of management formerly vested in executives only. These plans in their practical working seem to demand some sort of

profit sharing or wage dividend scheme to complete the appeal to the employe's self interest.

The plans under the first head have been in use long enough to be fairly well tested, and their points of weakness and strength well recognized. Those under the second head are still in the experimental stage, for they have never gone through a period when labor was not scarce and wages and profits both high.

The writer has not sought in this paper to hold a brief for any particular plan, nor does he feel competent to pass final judgment, but the possibilities of improved production are so great, and the need for more efficient production so self evident in our present industrial system, that I feel justified in saying that even the newest experiments have fully paid for themselves, and that the principles involved open up a whole new area of production management.

The Training of Foundry Executives

Paper Written for the Columbus Convention by Two of the Professors of the Technical Dept. of the University of Illinois at Urbana, Ill.

By B. W. BENEDICT and R. E. KENNEDY

The foundry industry in its broad outlines consists of three elements: Recorded knowledge of the foundry art; the human organization, by which this knowledge is translated into useful work; and the mechanical facilities of production. Although these elements are of fundamental importance, the second, or the human organization, outranks the others in vital character. If the recorded experience of the foundry art were eliminated at one sweep, much of it would remain in the minds of men, and beyond a pause for readjustment, production would go on as before. We can foresee that out of this wreck the fundamentals would emerge intact, since during the course of time they have become an integral part of thought and habit. And likewise, if the mechanical tools of production were suddenly wiped out of existence, men immediately would begin the construction of other facilities —doubtless of greater usefulness and efficiency, being less hampered by traditional restrictions.

On the other hand these opportunities for reconstruction would not exist should it become necessary to completely replace the entire foundry organization. Its physical form might be duplicated without difficulty, but after replacing man for man the organization would be little more than a hollow shell. Grant it the will to work and the necessary intelligence, still it would lack the ability to function. Weeks and months would not serve to replace the knowledge and skill laboriously and painstakingly accumulated by foundrymen throughout successive generations. Instead of a temporary pause for reconstruction, there would be a long period of inactivity until a new and self-trained force was able to take up the intricate task of foundry production. Unquestionably, the human element is the keystone of the foundry arch and any failure now to build wisely and permanently will endanger the future welfare of this great industry.

Happily, we are emerging from that era when man was considered of no more importance than a machine. A few years ago the average foundry resembled a dungeon as much or more than it did a workshop. Then the heritage of the foundryman was dirt, dinginess, heavy tasks and pay unrelated to service. No more and in some cases less thought was expended on the worker as the producing element, than on the machine he used. He was, to use a familiar expression, a mechanical cog in a mechanical machine. There is nothing humiliating about being a cog—all of us are cogs—but as a human being and distinguished from the inanimate things of industry, every person is entitled to a place as a living cog in the machine that produces his daily bread. Just how much of the background of the labor situation today was born in the dingy interior of the old time foundry or shop cannot be stated with accuracy, but it is safe to say that there its broad outlines were laid. The radical had the form of his picture prepared for him, and all he needed to do was to supply the violent colors of exaggeration and prejudice to complete an appeal that has unsettled labor throughout the world. We, from our superior vantage point, are not misled by passion and untruth, but can we expect the worker living in a world of realities to pattern his thoughts in the same mold as ours? If we expect this in the face of the facts, we are credulous indeed. On the other hand, the bulk of labor is sound at the core, and ready to follow the call of true leadership. The irresponsible radical has no chance ultimately with the real leader; yet radicalism, temporarily at least, is in the saddle. Has leadership failed? If it has not, to what can we lay the present condition of distrust and unrest? The foundry operator who has less influence with his workers than the radical preaching doctrines that lead to chaos, can with profit turn on the light of self analysis. More leaders, and better leaders, is the answer to the problem of industrial unrest.

The foundry organization as a whole, is composed of four groups, as follows:

Owners, and financially responsible operators.

Executives of the higher class.

Foremen and subforemen.

Workers of all classes in shop and office.

The first named group is small, comprising less than one-half per cent of all persons engaged in the industry. Financial or other consideration may overtop technical requirements in making selections for this group, so it is entirely possible to have men in this most important class who do not understand the technique of the foundry business. This type, lacking the basic knowledge of the work which comes from personal contact with it, normally may be expected to be more interested in the financial aspects of operation than in the human phases of it. This, of course, is the position of practically all nonresident stockholders. The examples of successful industrial ownership by men who have "grown up" with the business" are so conspicuous as to prompt the suggestion that a broader extension of this type of ownership would go far toward bridging the artificial chasm that has in places grown up between employe and employer

The second group, or executives of the higher class such as managers and superintendents, is relatively small in numbers but is of an importance equalled only by the first group. It consisted of less than 1 per cent of the total number of employes engaged in the industry. Upon the men in this and the preceding group, numbering in the aggregate less than 2 per cent of the foundry organization, rests the entire responsibility for operation, for development and progress, and for conditions that affect the welfare of a multitude of people. In many instances these executives of high rank are in reality "the company" as they formulate policies and execute them. In every case the influence and power of this group is large, as it necessarily must be from the nature of industrial organization. Without doubt one of the greatest foundry problems today is the training of men for the higher executive positions. Although volumes have been written on this subject, and there are living examples of leadership of the highest type to pattern after, we possess no formula for this great task. "Leaders are born not made" is a saying that contains much truth. It is true insofar as character is concerned, since this fundamental element of leadership is the manifestation of the spiritual quality of man which is quite beyond the reach of human manipulation. But leaders are "made" when knowledge is added to character. The possession of character alone is not sufficient, nor is leadership attained by a mechanical process of acquiring knowledge. Regardlessof the plan of training employed, the ultimate result will be naught if the basic traits of char-

acter are lacking. Leadership cannot be constructed on a foundation of sand.

Linking Education With Industry

It is not the purpose of this paper to discuss the entire topic of training foundry executives, but that phase of it falling within the realm of the technical school. It goes without saying that a technical training is not an absolute requirement in the training of successful foundry executives. There are other routes of attaining the end sought, but unquestionably the technical school is more direct and effective than any of those offered by the "school of hard knocks." A technical training develops the ability to think in logical and accurate terms; it stimulates the imagination and initiative; and enlarges the mental horizon until it includes a working knowledge of the fundamental laws of mathematics, science and engineering. It is pre-eminent as a medium for developing mental power. For a number of reasons, which space prevents mentioning here, it has not placed sufficient emphasis upon the development of those qualities which make for leadership. This fact is recognized by leading engineers and educators, and at present there is a pronounced tendency to remold curricula and teaching methods on lines that will make the technical schools ultimately more effective in this respect. A comparison of the courses of instruction as administered now and a few years ago by technical schools throughout the country shows that significant changes in educational methods are taking place. At the University of Illinois the reorganization of the courses in shop work to conform to modern industrial practice, is a typical example of this evolution in technical education. With the coming of the modern industrial era, with its revolutionary changes in methods of management and of production, industry has been demanding increasing numbers of men especially trained for and qualified to carry on the diversified tasks of the new order of things. Men are wanted who understand the principles of management, modern methods of production, the standardization of manufacturing processes, scientific methods of paying for work done, specialization of labor, economics of manufacturing, the development and use of labor saving machinery, and above all, the ability to organize and direct working forces.

Are Natural Sources for Executives

While the technical schools are the natural sources of supply for recruits to fill these specialized positions, it is obvious that they have not been equipped with facilities especially designed for this particular task. The situation was met in part, at the University of Illinois, by organizing the shop laboratories as a manufacturing plant, for the purpose of creating an industrial laboratory that would provide training in real problems of operation and management. Insofar as available resources would permit the shop plant was arranged to manufacture a standard product (an 8-horse-power, 2-cylinder gas engine) by generally accepted shop production methods. Operations were standardized, working schedules provided, improved facilities installed, stock and tool rooms provided, and production control methods introduced in all of the four departments of the plant. The aim was to create a manufacturing laboratory in which the students as workers and executives, would perform the various functions of production and of management incident to the manufacture of a commercial product. Since the year 1912, when the plan was adopted, the results have demonstrated that its ideals and working principles are fundamentally sound and that it has great possibilities for further development. Close co-operation between industry and the technical school is essential to the fullest developement of any plan of training, and it is the hope of further stimulating the great interest of this association in technical training that the administration of the plan in the foundry department is presented here.

The ideals underlying the course in foundry instruction are:

1. To promote knowledge of the principles of modern foundry management, by actual experience in directing the work of producing castings in a modern foundry by efficient methods.
2. To develop a working knowledge of modern foundry practice by performing the work of producing castings with modern methods and equipment.

The operation of the plan is simple. At the beginning of the school term an order is issued by the superintendent for a given number of gas engine parts. As all work operations have been standardized, this work order represents a total working time in hours usually well within the total student shop hours. It is possible for the order to be completed before the end of the term, if the student managers plan their work as they should, and the student workmen attain the required efficiency of production. A definite standard of achievement is thus set up, which calls for the individual and collective effort of the entire class. The commercial foundry with all its problems of management and of technical performance is transferred to the university laboratory. The training consists of the experience gained with real foundry operation.

Students Organized in Sections

After a short preliminary period of work at machine molding, coremaking and at the cupola, each of the four student sections (from 25 to 50 men) is organized as a complete foundry operating unit. Units are divided into two groups: (a) staff assistants and (b) shop workers. The staff plans and executes a production schedule to secure the completion of the required number of parts on the specified delivery dates. It issues work orders direct to the working group, and exercises the functions of foundry manager, foremen, inspectors and clerks. The working group do all the work of molding, coremaking, cupola charging, pouring, cleaning,etc. General supervision is exercised by the foundry instructors who act as superintendent and assistant superintendent, but their part is instructional only. They assume no responsibility for operation.

Students are transferred from one position to another at intervals, so that in the course of the term they perform all of the important tasks. The time is about equally divided between the staff and shop positions. Of the actual time spent at work on the floor 60 per cent. is devoted to coremaking and molding, while the remainder is occupied at the cupola, cleaning castings, and at general labor work. At the beginning of the term the assignments of each man are listed with accompanylng dates, so the shift from one position to another is accomplished automatically and with no confusion.

As each work operation is standardized, it is possible to predict the amount of work which each unit should produce from week to week. Immediately after the number of available student working hours is established, a production output schedule is made by the staff and the number of castings to be completed from week to week is entered in the records and the production control board posted accordingly. The board shows graphically the relation of actual output to expected output, and the status of work in the process of completion. Foundry operators in search for future Executive can make selection with little chance of error by observing the staff assistants directing the foundry activities from this board. The marked contrast in the ability of individual students to organize and direct the work of others is immediately apparent here. None of the conventional college examinations reveal this exceedingly valuable information.

Personnel of Foundry Staff

The staff is composed of the following members, called assistants: Production, mechanical, planning and routing, dispatching, standard practice, materials, accounting and inspection. The chief production assistant has entire charge of production. It is his duty to secure the required output by co-ordinating the activities of the various departments in his section. He is in effect the boss of the shop. He is directly assisted by the routing, dispatching, core production and materials assistants, each one of whom performs special duties. Tools, machines and facilities used in the production of work are looked after by the mechanical assistant. Inspections of and reports concerning molds and cores made in each section unit are the work of the inspection assistants. Reports of shop performance, and of attendance, and preparation of production

charts are made by the accounting assistants. Standard instruction for the performance of all staff duties have been prepared in some detail so the more intelligent students take up the work of the various staff functions without difficulty.

The problems which the staff are called upon to solve are identical with those which are ever before the operators of commercial foundries. There are not only the usual routine problems of operation to struggle with, but also questions to settle regarding molding practice, use of pattern plates, mixing of iron and brass for various kinds of castings, the employment of molding machines, etc. These problems are not solved by the instructors with the students as spectators. Responsibility for operation is squarely up to the staff, and it is their task to work out solutions by the aid of the standard instructions and with the friendly council of their instructors. The average staff has a sprinkling of born leaders in it, who thrive under the load imposed by this responsibility, and who are fully competent to solve their problems with the aids at hand.

In common with other college shops, the foundry is not equipped with the most efficient facilities in all instances, for the universal reason—lack of funds. Modern equipment is added from time to time, making it possible to demonstrate its productive capacity, and also to compare the relative economy of various methods of performing the same operations. Every opportunity is taken to stage these demonstrations in order to stimulate the imagination of the student workers and increase their interest in the development of improved methods and devices. Investigations are made in great detail with the aid of the stop watch and the results recorded by various observers on special forms. From the tabulated results, standard work schedules are prepared by standard practice assistants, and these are made up later in permanent form for shop use. This feature of the training is of considerable value in drilling the eye to observe accurately, and also to develop the practice of thorough investigation of the facts. The time devoted to molding and coremaking is not sufficient to develop any great skill at these tasks. As the aim of the course is the training of executives and not of molders, the development of skill is considered of minor importance, but students erpecting to enter the foundry game are urged to acquire practical molding erperience in a modern commercial foundry.

In addition to the regular staff and shop work, lectures are given on theoretical subjects such as properties of cast iron, cupola operation, molding machine practice, planning and scheduling of work, analysis of work operations, time study, etc. From time to time noted foundrymen (whenever they can be induced to come) and molding machine manufacturers give lectures on design of foundries, the production of castings, and molding machine operation. Lectures from prominent men in the foundry world are considered of great importanec in this training, not only from their informational value, but also as demonstrations in personality.

Another feature of the course which has proved its worth is the systematic study of foundry trade literature, including magazines and catalogs. This brings the student in contact with the latest developments in methods and equipment. Foundry problems involving designs of foundries for the production of certain lines of castings, layout of core rooms, selection of equipment for specific kinds of work, etc., are part of the required work. Exhibits of foundry interiors and of equipment, from magazines and catalogs are displayed to assist in the solution of these problems. The question of more efficient equipment for producing gas engine parts in the university foundry is a frequent matter of investigation. Reports are submitted recommending certain equipment selected from the available advertising matter, with arguments and figures to support the proposals made. It is obvious from these reports that the better class of students (the future executives) gain clear conceptions of the principles of management and production, and are able to apply this knowledge in the solution of practical problems.

Learns Necessity of Co-ordination

As the plan of instruction is identical in principle throughout the other departments of the shop laboratories, the student acquires during the entire shop course a rather definite understanding of the fundamental principles underlying the production of goods. He learns by personal experience the necessity of co-ordination between departments and how failures in planning and in organization shatter production and decrease efficiency. When in positions of responsibility he observes the results of careless and indifferent work from an angle that did not appear to him when at the bench or cupola. His experiences, although in miniature, are the same as he would acquire under similar circumstances in industrial life.

Roughly about 5 per cent of all students taking the shop courses display conspicuous talent of leadership and at the same time possess the essential elements of character. The percentage varies in classes. Some section groups contain men of outstanding executive ability, while others have none of this type. Engineering students are a selected group, but at that, the percentage of them destined to fill high places in the management of engineering or industrial affairs is relatively small. This group, small as it is, is worthy of the highest educational advantages which the wealthiest nation on the globe can bestow upon it. No other group of young men exceeds this one in importance, not alone to industry, but to society which industry serves. As the leaders of to-morrow they must be prepared for the weighty responsibilities awaiting them. This task is a joint one for the technical school and industry to carry on together by sympathetic and effective co-operation. This association, as representative of the progressive spirit of the foundry industry is the logical agency for inaugurating a policy of co-operation that will enable the technical school to fulfill its largest mission. The hope is expressed that such a policy will be a subject for early consideration.

Catalogues and Booklets

Independing Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, are distributing an interesting circular to be known as "Circular No. 36", describing the new Thor portable electric drill stand.

The Thor electric drill stand is a recently developed machine tool, an addition to the regular line of electric drills, and is so designed that a wide range of Thor electric drills can be used according to size of drill and nature of work. Perfectly balanced with weight located inside of column, which in all cases gives the proper sensitiveness, when operated either with small drills. Also provided with stop collars for certain depth drilling. Drill heads, as well as stop collars, are equipped with hand levers, thereby eliminating the use of wrenches when adjustment for certain height is necessary.

This stand is made to fit Nos. 000,00, 0, 01, 1 and 2 Thor portable electric drills.

The illustrations show clearly how the electric part of the machine is brought into action, also how the change can be made from the portable electric drill to the sensitive drill press in 25 seconds.

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The Foundrymen's Convention

FOR the first time in twenty-five years, the American Foundry Men's Association have decided to let a year go by without holding a convention. This is regrettable for many reasons. Canada's quota of visitors would have been as good as usual, and possibly better, judging from the number of enquiries which have been received at this office, asking for dates and place of holding, etc. But the visitors who attend the convention do not contribute very much towards the financial success of the enterprise. In order that the convention and exhibits may be a financial success it is necessary that it be well patronized by the exhibitors. In this respect, as well as in numbers in attendance each convention so far has surpassed any which came before it, and if there should be the slightest possibility of backsliding, ten thousand times better, not have it at all. The next convention must, and will, be the best one yet. We predict this with every confidence, as The American Foundrymen's Association can be depended ou not to do anything unless they know in advance that it will be successful.

When we speak of financially successful we do not mean to imply that anyone pretends to make a profit directly out of the convention. Such a thing is not possible or desirable, but it is certainly desirable that those who are responsible for its success do not have to dig too deep into their pockets in order to make it so. An affair of this kind is valuable chiefly from an educational standpoint for the reason that those who do not have an opportunity at small expense to see all that modern inventive genius has been able to produce. As a result of this the exhibitors hope that their exhibits will be sufficiently advertised to reimburse them for the expense to which they have been put. Of course failure was not thought of. If the manufacturers of foundry supplies and equipment would put their heads together they would make it go, but it has been concluded that springtime has advantages. Up till about ten years ago conventions were all held in the spring, but on account of delay in getting the building ready at the Buffalo convention it was postponed until fall. It was a decided success, and for that reason no one thought of reverting to the spring again until this year. The fact that the entire year 1921 is being skipped does not make the gap between conventions particularly greater than that caused by the Buffalo delay. From the spring of 1911 until the Fall of 1912 was practically the same as from the fall of 1920 until the spring of 1922, but the fact that an entire callendar year was not omitted did not give it such an unfavorable appearance. The following announcement from Mr. Hoyt, the secretary of the association, tells its own story:

"At the annual meeting of the board of directors of the American Foundrymen's Association, in Rochester, N.Y., December 7, 1920, invitations for the next convention were referred to the Committee on Convention and Exhibits. When this committee met in Cleveland on March 30th, to consider the place of the next meeting it was found that in none of the cities Atlantic City, Buffalo, Chicago, Cincinnati, Cleveland, Columbus, Detroit, Indianapolis, Montreal, Rochester, Toronto Springfield, Mass., and St. Louis, which were considered was it possible to find, during September or October, adequate hotel accommodation and exhibition facilities to properly care for such meetings as were held in 1919 and 1920.

Confronted with this situation and taking into consideration general industrial conditions, the committee adopted a resolution recommending to the board of directors that the convention be held in New York City, in October or November of this year, without exhibits.

This recommendation was referred by letter to the members of the board and expressions of opinion requested. On May 28th the executive committee of the board met, and after due consideration of the recommendations of the committee, and the expressions of opinion by the members of the board, it was unanimously resolved that the next Convention and Exhibit of the American Foundrymen's Association be held in April or May, 1922, at a place to be selected by the Convention and Exhibits Committee.

With the hotels disposed to reserve a larger percentage of their rooms for a convention in the spring than in the fall, and with the probability that better exhibition facilities can be secured in the spring of 1922, it is hoped that no difficulty will be experienced in making satisfactory arrangements for the next convention and exhibit, the place and date of which will be announced later."

It Might Be Worse

THE Canadian farmer is determined that he will not pay the high prices which are being asked for implements when he can not get the war-time price for his produce, and arguments of the most carefully prepared variety handed to him on silver servers or by any other means have apparently failed to budge him from his stronghold of determination. This being the case, the manufacturers of such goods find themselves unable to dispose of their stocks, and with their storehouses filled to overflowing, in preparation for the regular run of seasonable business which did not materialize, they are compelled, at a terrible loss to themselves as well as to their employees, to close down their plants for at least a few weeks and possibly months.

Canada being an agricultural country our industries naturally follow suit, and as a result some of the largest agricultural implement concerns in the world are located in this country. With these closed down a big difference is made in the circula-

tion of money and in the condition of the working man and his family and incidentally to the groceryman who wants to hold that man's trade. Fortunately it is only the intention to suspend operations for a short time, and as winter is a long way off it is to be hoped that the factories will be in operation long before then.

To be out of employment during the summer time, while bad enough, is not to be compared with being idle in the winter.

Another aspect of the situation is that there is work to do on the farm at this time of the year, and if a man is really anxious to get along he can get some kind of a lift by helping out with this work while it lasts. The brightest feature, however, is that purchases which are postponed will have to be made sooner or later and business will inevitably be brisk when this time comes. Implements which should have been discarded this year will certainly not last out another season.

Picking Up in Other Lines

REPORTS from different parts of the country indicate that mercantile business is picking up, and that the larger stores are buying heavily and laying in good stocks in anticipation of a brisk fall trade. It may be that the groceryman has sold out his heavy stock of high priced goods etc., which he laid in while the war was on and that he is preparing to stock up with some fresh supplies. It is wonderful how unfortunate the merchants of all classes were in stocking up so heavily just when the prices were at their zenith. We have a faint recollection of drinking tea without sugar and eating pastry made from a corn-meal concoction, under the delusion that the supply of food stuff was low. Now we find that everybody was stocked up with at least a three years' supply which is not quite all gone yet and that the price can not be properly adjusted until a cheaper stock can be bought. Surely this gag can not much longer survive, and unless some other joke is sprung the cost of food should soon be reduced and the lower cost of living should become a reality.

Only One Piece Left

IT is funny the ideas the human race can conceive when there is a chance to make a little money. That "only one piece left" was a good one on the merchant tailor. That worked out splendidly through the entire four years of the war. When a fellow's fifteen-dollar Sunday suit began to look shabby and he began to look around for another he would see a similar one hanging in a window, placarded fifty or sixty dollars, with the word "only" prefixed to it. He would, of course, move on to the next, only to see the same thing there. If he stepped inside and made inquiry he would learn that this was a first class piece of "West of England" goods which had been purchased before the war which accounted for his being able to let it go at that ridiculously low figure. And then he would spring the old chestnut that this was the last of it and when this suit length was gone there would be no more. Needless to say it would be snapped up. When this one was gone he could generally dig up another piece which had been mislaid and which he really did not know that he had.

Not Ideal for Strikes

THE year 1921 is not what could be considered as an ideal year for strikes. Some of the craftsmen have seen visions of improved conditions to be secured by this means and have undertaken to bring them about, but with doubtful success. In this respect we give the moulders credit for using sound judgment. To the best of our knowledge and belief there is no industrial unrest in any Canadian foundy. No matter what grievances a workman may feel that he has, he is only adding to his difficulties by turning his back on what he has without first ascertaining what are his chances of winning out. During these uncertain times when business is none too brisk it would look the part of wisdom for both employer and employee to do everything possible to pull together. It is not the working man's fault that times are as they are, but still he must remember that his employer is not in a humor to talk better conditions in the face of what he, himself, has to contend with. Right or wrong, these are not times to complain about the other party. Each must take his medicine and wait until better conditions are within reach.

Heating and Ventilating

THE subject of heating and ventilating is one which should be of interest to foundrymen, although the weather during the last few weeks has not been such as would encourage the thought of heating. Regardless of this fact and the fact that foundry operatives are called upon to do some very sweaty jobs the average foundry is undoubtedly one of the most uncomfortably cold spots in which men are asked to work during the winter time. Chapped hands are universal in the foundry. The effort usually put forth to hold what heat there is, usually holds a lot of foul, dirty air which would be better let go. To keep the shop warm, and at the same time free from impurities has been a study with heating and ventilating experts for a long time with the result that it is no longer necessary to have a foundry any more unpleasant than any other department. In our next issue we will publish the views of some of the best authorities on these subjects, and we hope to interest the foundry owners to an extent which will enable them to see their way to make a choice of one of the various systems and install it before the cold weather.

Personality In Industry

IN the opinion of Professor Walter J. Matherly "Personality is the centre of all industrial values." While discusing the matter in a recent issue of Industrial Management he brings out many points of decided value, a few of which we reproduce. In his opinion Personality, whether within or without industry, is the "ego" in man. It is that which makes him different from other men. It is not that which he pretends to be but that which he is. It is the outward expression of his inward self. It is the man himself.

Personality, as found in industrial plants, is of many types. These are the weak personalities. These are the ones that are vacilitating, who possess no ambition, no desire to climb up, no enthusiasm. There are the strong personalities. These are the men who are energetic, forceful, efficient, intensely interested; the men who hold responsible positions; the men who do things. There are disagreeable personalities. These are the individuals who rub us the wrong way. They are the obnoxious folk whom we may classify as the egotists, the autocrats, the wheedlers, and the distrusters.

Personality of the strong and forceful variety is the greatest asset in industry. While it may not be shown in annual balance sheet, yet it is certainly reflected in company earnings and in the efficiency with which products are put on the market. Personality is the energizing power in industrial organization. It enables executives to permeate every departmental activity and to get others to respect and carry out their program of activity.

Personality is a pre-eminent factor in salesmanship. Success cannot be attained in vending goods unless a man has force of character. A sales representative can not convince his customers of the superior qualities of his wares, and get orders wherever he goes unless he posseses an abundance of personal magnetism. Personality helps an individual to secure a job. It help him to hold it. It gives him power to outgrow it and to reach up for higher jobs. It, coupled with brains and hard work, endows him with the capacity to scale the utmost business heights.

To develop personality, several qualities are necessary. The foundation is a resolute and disciplined will. Without will-power a man is crippled from the very beginning. Closely associated with will power is self-control. That is the second essential. Without the mastery of self, the mastery of industrial enterprise is an empty dream. The next element is self-confidence. An individual might be able to control himself, and even have the will to do, yet lack faith in his ability to carry out his plans. Another quality which is imperative is a mind eager to know and understand. It is impossible to get very far without knowledge. Unless human beings understand what they learn, they flounder about in darkness.

LAYING OUT CAST DIAMETRICAL PITCH GEARS

In the April issue of "Canadian Foundryman" we published a valuable table for laying out cast gear teeth, by Mr. John S. Watts, in which the author points out that the standard cut gear work had to be modified in order to allow for imperfections in the castings. The table which we published was well received, but was in such small type that several complaints were sent in with regard to it. By special request we are reproducing the article with the table set in larger type. This article is well worth preserving and should be framed and covered with glass.

The teeth of a cast gear differ from those of a cut gear in having more clearance at the root and between the teeth to allow for roughness and possible over size.

The top line of the table gives the diametrical pitch, and the second line the corresponding circular pitch, in inches. The third line gives the dimension "A," which is the addendum of the teeth, see Figure A.

This dimension is the same as for cut teeth, and is equal to

$$\frac{1}{DP}$$

"B" is the dedendum, and is 3/64", more than it would be for a cut gear, to ensure that the teeth will clear at the root, even if the casting is slightly oval, as it will very likely be, in any but very small gears. The formulae used to determine the dimension "B," is

$$B = \frac{1.157}{DP} + 3/64''$$

"C" is the thickness of the tooth on the pitch line, and is necessarily less than that of a cut gear of the same pitch, the formulae used in making up the table is,

$$C = \frac{1.4785}{DP} - .02''$$

"R" is the radius at the base of the teeth and is equal to

$$\frac{.3927}{DP}$$

"D," see figure 1, is equal to the pitch

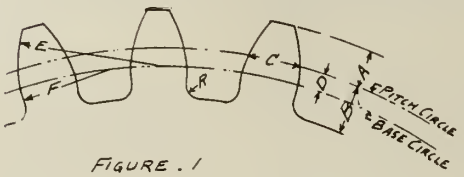

FIGURE. 1

diameter divided by sixty, and the radii, E and F, as given in the table, for the various pitches and number of teeth, will give the correct profile to the teeth. It will be noticed that for gears having over 36 teeth, a single radius is used, as no undercutting is necessary in the teeth of gears having more than that number of teeth. Gears having over 360 teeth, will be practically racks, and should be made with teeth having straight sides at 14½ degrees inclination, the other dimensions being as given in the table.

Radii for pitches larger or smaller than those given in the table, can be found by proportion, as these radii are in direct proportion to the circular pitch, or what is the same thing, in inverse proportion to the diametrical pitch, that is the radii for a 10 DP gear will be half of those for a 5 DP gear.

When making patterns for a pair of gears, the pattern-maker must give the teeth a slight taper or draw, along the face of the gear, to facilitate withdrawing the pattern from the mould, and care should be taken to ensure that, in assembling the machine in which these gears are to be used, the thick end of the tooth in the gear, is in mesh with the thin end of the tooth in the pinion, and vice-versa, as otherwise the teeth will be carrying the whole load on one corner.

D.P.	½		¾		1		1¼		1½		1¾		2		2¼		2½		2¾		3		3½		4		5		6		7		8	
C.P.	6 9/32		4 3/16		3 9/64		2 33/64		2 3/32		1 57/64		1 37/64		1 25/64		1 1/4		1 9/64		1 3/64		57/64		25/32		5/8		33/64		7/16		25/64	
A	2		1 2/64		1		13/16		21/32		37/64		½		7/16		13/32		3/8		11/32		9/32		¼		13/64		5/32		9/64		1/8	
B	2 23/64		1 19/32		1 13/64		31/32		13/16		23/32		5/8		9/16		33/64		15/32		7/16		3/8		2/64		9/32		¼		7/32		3/16	
C	2 15/16		1 15/16		1 29/64		1 5/32		31/32		53/64		23/32		5/8		37/64		33/64		15/32		13/32		11/32		9/32		7/32		13/64		5/32	
R	25/32		33/64		25/64		5/16		17/64		7/32		3/16		11/64		5/32		9/64		1/8		7/64		3/32		5/64		1/16		3/64		3/64	
TEETH	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F	E	F
12	5 1/32	2 1/32	3 11/32	1 13/32	2 39/64	1 1/32	2 1/64	13/16	1 1/16	43/64	1 1/16	37/64	1 17/64	½	1/8	7/16	1	13/32	15/16	3/8	27/32	21/64	23/32	9/32	5/8	¼	½	13/64	13/32	5/32	23/64	3/64	5/16	1/8
13	5 3/16	2 1/8	3 15/32	1 13/32	2 39/64	1 1/16	2 3/32	55/64	1 3/4	23/32	1 1/64	5/8	1 5/16	17/32	1 5/32	15/32	1 3/64	27/64	61/64	25/64	7/8	23/64	3/4	5/16	2/32	17/64	17/32	7/32	7/16	11/64	9/8	5/32	2 1/64	3/64
14	5 5/32	2 2/64	3 1/64	1 5/16	2 47/64	1 1/32	2 1/16	31/32	1 5/32	13/16	1 1/16	45/64	1 1/8	33/64	1 1/32	35/64	1 3/32	3/64	1	7/16	29/32	13/32	25/32	23/64	1 1/16	5/16	35/64	¼	23/64	13/64	25/64	11/64	11/32	5/32
15	5 9/16	2 1/16	3 49/64	1 5/16	2 53/64	1 1/32	2 1/64	1 1/16	1 1/8	29/32	1 1/8	25/32	1 13/32	47/64	1 1/4	39/64	1 1/8	17/32	1 1/32	½	15/16	29/64	1 13/16	25/64	45/64	11/32	9/16	17/64	15/32	7/32	13/64	3/16	23/64	11/64
16	5 27/32	2 1/64	3 57/64	1 3/32	2 55/64	1 1/32	2 1/32	1 1/16	1 1/16	63/64	1 21/32	27/32	1 1/32	47/64	1 1/32	41/64	1 1/64	21/32	1 1/16	17/32	31/32	½	53/64	27/64	47/64	3/8	19/32	13/64	31/64	¼	32	7/32	3/8	11/64
17	6 1/32	3 3/64	4 1/32	2 2/64	3 1/64	1 1/32	2 1/32	1/4	2 1/64	1 1/64	1 23/32	55/64	1 33/64	25/32	1 1/32	45/64	1 1/64	5/8	1 1/64	37/64	1	17/32	55/64	7/16	3/4	25/64	33/64	5/16	½	17/64	7/32	7/16	1/32	5/16
18	6 3/32	3 1/32	4 3/32	2 1/64	3 3/64	1 1/16	2 1/32	1 1/64	2 1/64	1 1/64	1 23/32	53/64	1 3/16	27/32	1 3/64	43/64	1 1/64	5/8	1 1/32	3/16	1 1/32	3/16	57/64	3/64	25/32	27/64	5/8	11/32	33/64	9/32	16	1/32	25/64	7/32
19	6 15/32	3 1/32	4 5/16	2 3/64	3 15/64	1 1/64	2 1/32	1 1/16	2 1/32	1 1/64	1 27/32	51/64	1 1/32	29/32	1 1/64	41/64	1 1/32	19/32	1 1/64	35/64	1 1/32	11/64	59/64	33/64	13/16	7/16	41/64	23/64	1 1/32	13/64	15	1/4	13/32	7/32
20	6 21/32	3 3/64	4 27/64	2 31/64	3 1/32	1 1/32	2 1/32	1/2	2 1/32	1/64	1 29/32	49/64	1 1/32	15/16	1 1/64	27/64	1 1/64	3/4	1 1/32	1/64	1 1/64	5/8	61/64	35/64	27/32	15/32	21/32	3/8	9/16	5/16	32	17/64	27	15/64
21	6 27/32	3 3/64	4 3/64	2 5/64	3 1/32	1 1/64	2 1/64	1 1/32	2 1/32	1/64	1 29/32	49/64	1 1/32	15/16	1 1/64	27/64	1 1/64	3/4	1 1/32	1/64	1 1/64	5/8	61/64	35/64	27/32	15/32	21/32	3/8	9/16	5/16	32	17/64	27	15/64
22	6 31/32	4 1/64	4 1/64	2 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
23	7 3/32	4 1/32	4 1/64	2 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
24	7 3/32	4 1/32	4 1/64	2 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
25	7 13/32	4 1/64	4 1/16	2 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
26	7 7/16	4 1/64	4 1/16	2 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
27	7 25/32	5 1/32	5 1/32	3 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
28	7 29/32	5 1/32	5 1/32	3 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
29	7 15/16	5 1/32	5 1/32	3 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
30	8 1/32	5 1/32	5 1/32	3 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
31	8 1/16	5 1/32	5 1/32	3 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
32	8 1/32	5 1/32	5 1/32	3 1/64	3 1/64	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
33	8 5/16	6 1/32	5 1/16	3 1/64	4 1/32	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
34	8 7/16	6 1/32	5 1/32	3 1/64	4 1/32	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
35	8 17/32	6 1/32	5 1/32	3 1/64	4 1/32	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
36	8 9/16	6 1/32	5 1/32	3 1/64	4 1/32	1 1/64	2 1/64	1 1/32	2 1/64	1 1/32	1 31/32	63/64	1 1/32	31/32	1 1/64	13/32	1 1/64	27/64	1 1/64	13/32	1 1/64	5/16	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32	1 1/64	33/64	1 1/64	17/32
37-40	8 13/32		5 5/8		4 13/64		3 23/64		2 13/16		2 13/32		2 7/64		1 7/8		1 11/16		1 15/32		1 13/32		1 13/64		1 1/16		27/32		45/64		39/64		17/32	
41-45	9 13/64		6 3/16		4 41/64		3 23/32		3 3/32		2 2/32		2 2/64		2 1/16		1 55/64		1 1/16		1 35/64		1 2/64		1 5/32		59/64		25/32		21/32		37/64	
46-51	10 1/8		6 3/4		5 1/16		4 1/16		3 3/8		2 57/64		2 17/32		2 1/4		2 1/32		1 23/32		1 1/16		1 7/16		1 1/32		1 1/64		27/32		23/32		5/8	
52-60	11 1/2		7 2/32		5 3/4		4 15/32		3 53/64		3 7/64		2 7/8		2 9/16		2 13/64		2 3/32		1 29/32		1 49/64		1 7/16		1 13/64		61/64		53/64		23/32	
61-70	13		8 41/64		6 1/2		5 13/64		4 11/32		3 23/32		3 1/4		2 57/64		2 39/64		2 3/8		2 11/64		1 55/64		1 5/8		1 7/16		1 3/32		59/64		13/16	
71-90	15 23/64		10 5/16		7 23/32		6 13/64		5 5/32		4 7/16		3 55/64		3 7/16		3 3/32		2 55/64		2 37/64		2 7/32		1 13/16		1 35/64		1 9/32		1 7/64		31/32	
91-120	19 35/64		13 1/32		9 25/32		7 13/16		6 17/32		5 13/32		4 57/64		4 11/32		3 29/32		3 7/16		3 17/64		2 55/64		2 7/16		1 61/64		1 5/8		1 25/64		1 7/32	
121-180	26 51/64		17 27/32		13 3/8		10 11/16		8 59/64		7 47/64		6 11/16		5 13/16		5 11/32		4 7/8		4 7/16		3 53/64		3 11/32		2 43/64		2 7/32		1 29/32		1 43/64	
181-360	43 7/64		28 23/32		21 3/16		17 3/16		14 13/64		12 3/16		10 23/32		9 29/32		8 13/32		7 13/16		7 3/16		6 5/32		5 25/64		4 13/64		3 49/32		3 5/64		2 1/16	

TABLE FOR LAYING OUT DIAMETRICAL PITCH GEAR WHEEL WITH CAST TEETH.

HAMILTON

30 Years Experience Behind our--

Climax Silver Lead

For medium and lighter grades of castings. It will brush on the mold. It is sold at a moderate price, and invariably proves its worth at the first trial.

XXX Ceylon

Pure Ceylon Plumbago for use on the heaviest green sand castings. Produces a perfectly clean casting.

Imperial Plumbago

In constant use among foundrymen for thirty years for making stove plate and ornamental work of every kind.

Gambite

Is made from the best quality Canadian Spruce and contains 52% of soluble solids.

Foundry Facings

and Supplies

are high quality products economically made and economically sold **direct to you** by the manufacturer.

Money Savers

The Hamilton Facing Mills Co., Limited

Head Office and Mills

Hamilton, Ontario, Canada

HUDSON RIVER BRIDGE WILL BE LARGEST STRUCTURE IN THE WORLD

WHEN completed, the Hudson River Bridge will be the wonder of America, as far as bridges are concerned. Here are some of the more important features and figures in connection with it.

The main outlines of the bridge, as at present determined, call for a total length from anchorage to anchorage of 6,660 ft, this to be divided into two shore spans each 1,710 ft. long, with a central span across the river of 3,240 ft. Including the anchorages the length is 7,460 ft.

A roadway 220 ft wide, will be suspended from four steel cables, each consisting of 80 lines of eyebass arranged in three banks and enclosed in a watertight tubular casing of bronze plating; the diameter of this being 15 ft. The upper deck of the bridge will have a roadway for automobiles and motor trucks, this to be 155 ft. wide in the clear. There will also be a two trolley line track and two 17 ft. walks for passengers. On the lower deck will be ten trunk railway tracks.

If the Olympic; Leviathan; and Aquitania were placed in the center span, there would still be four hundred feet to spare, and although the combined weight of these three vessels is 160,000 tons this would not equal the weight of the main span.The two main towers of the bridge will each be 840 ft. high, this meaning that even the Woolworth building will be overshadowed as the latter is only 792 ft in height.

Naturally the anchorages on such a bridge will be of huge proportions. The engineers at present call for a mass of masonry measuring on its base 400 ft. by 375 ft. wide The top of the anchorage will be 220 ft. above the ground level. On top of each base it is proposed to erect two large office buildings 70 ft. wide, 250 ft. long, and 280 ft. high; thus on the two anchorages there will be four modern office buildings, which will of course contribute considerably to the annual receipts of the bridge.

The structural part of the towers, which carries the load of the cables will not be visible, for externally the the towers will look like solid granite. This stonework will act merely as a covering, but inside this facing will be massive, strongly braced steel towers. The protection to the steel work throughout the construction of the bridge has been planned to such an extent that it is expected that one painting of the towers will be good for at least a decade. The total weight of steel in each tower will be 35,000 tons.

A big feature in the construction is that practically the whole of the bridge will be weatherproof. In other words the steel work will be so completely enclosed with rain and moisture excluding material that the cost of repainting will be reduced to a minimum. It is stated that only 15 per cent of the steel work will be exposed. This feature alone should save at least $500,000 annually, for it would at least cost that amount to repaint the bridge annually.

It is impossible in this space to more than barely touch on some of the figures of construction, but even from the foregoing one can grasp an idea of the magnitude of the task. The cost will be about 110 million dollars, but it is expected that the one bridge will be equal in capacity to twenty tunnels, so that the cost is a secondary consideration.

CUTTING COSTS AND HANDLING MATERIALS

(Continued from Page 19)

cab or with a platform to carry the operator. The versatility of these trucks on the ceiling is such that any product within its capacity has a type that is especially adapted for the work.

Tramrail Book Free

A most instructive illustrated book on tramrails as an economical means of handling and conveying materials has just been published. A copy of this new book will be sent without charge to readers of this paper who are interested in cutting their material handling costs.

CLASSIFIED ADVERTISEMENT SECTION

TWO CENTS A WORD, including the "Canadian Foundryman" box numbers; minimum charge is $1.00 per insertion, for 50 words or less, set in 6 point type. Each figure counts as a word. Display ads., or ads. set in border, are at the card rates.

SITUATIONS WANTED

FIRST-CLASS MOLDER WANTS POSITION as foreman or assistant; have necessary ability and enthusiasm to make good. Expert on latest methods for economical production. Open shop preferred. Canadian and United States references. Distance no objection. Salary a secondary consideration. All correspondence strictly confidential. Address inquiries Box 2512, Canadian Foundryman. (c9f)

FOUNDRY FOREMAN REQUIRES POSITION —Practical foundryman with 15 years' experience in Great Britain, United States and Canada is open for engagement as foundry foreman in shop doing marine or stationary engine work, general jobbing or machine molding. Good at handling men, and well up in cupola practice. Apply box 5521, Canadian Foundryman.

FOR SALE

CASTINGS IN BRASS, BRONZE, ALUMINUM for Electrical Engineering and general trade. Specialty—Aluminum Match Plates Castings. 20 years experience, foundry practice, and first-class work guaranteed. The Napier Foundry, Box 248, Walkerton, Ont. (c7f)

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Special attention given to rush orders. From famous Niagara District Pits.

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Manufacturers and Importers of High Grade Fire Brick, Fire Clay and General Supplies. Special Shapes, Cupola Block, Stoker Brick, Boiler Tiles, Stove and Quebec Heater Linings.

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May we send you descriptive pamphlet and full particulars?

W. W. WELLS, Toronto

In Brass Bronze Copper Nickel Tin & Zinc

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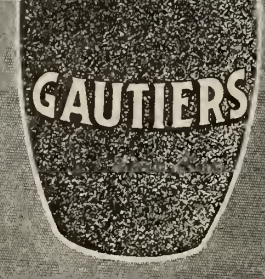

Manufactured For Over 50 Years

J.H. Gautier & Co.

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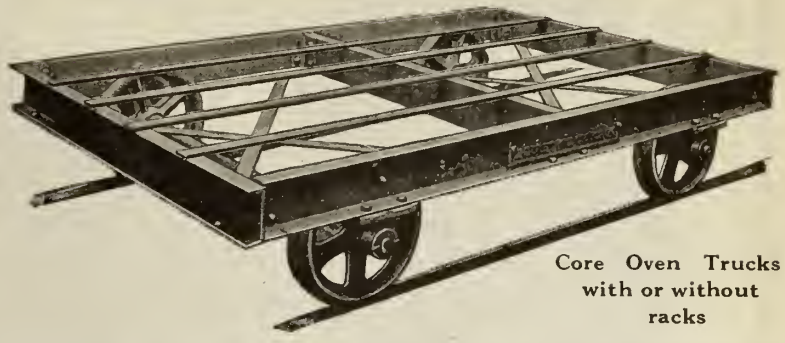
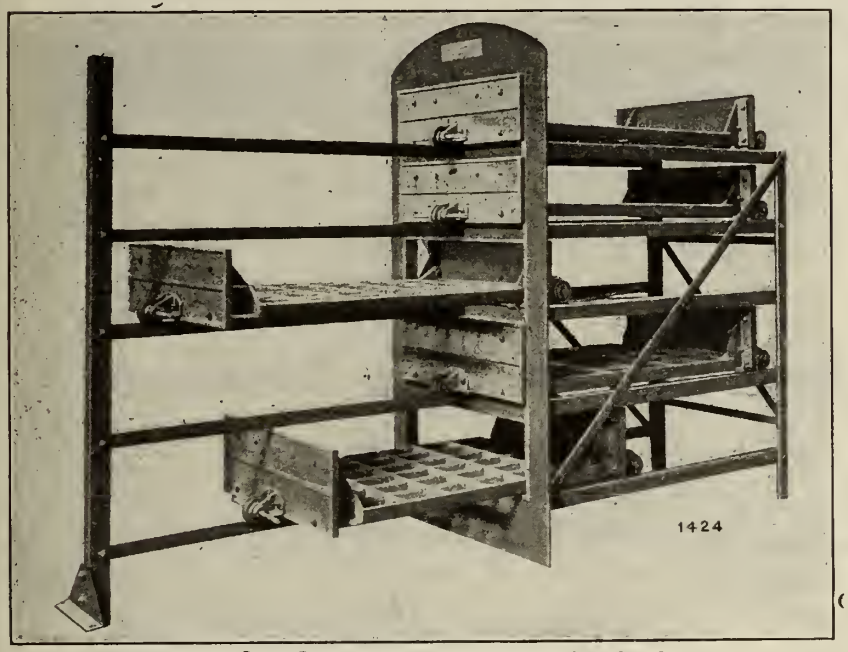
CORE ROOM EQUIPMENT

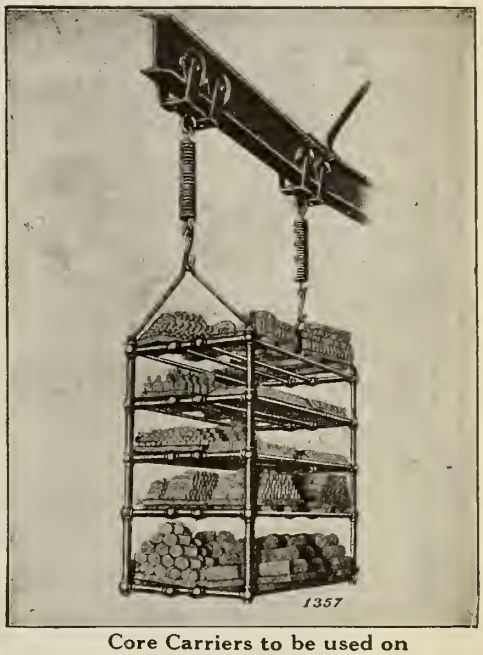
Illustrated is some of the equipment necessary for making cores by modern methods. This equipment is all made by the Whiting Corporation of Harvey, Ill. We are also distributors for Branford Vibrators and Accessories



Core Oven Trucks with or without racks

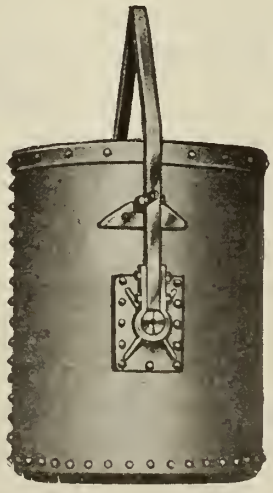


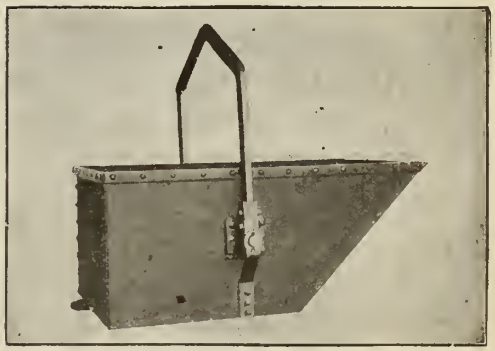
Drawer type Core Ovens made in different height drawers



Core Carriers to be used on overhead tramrail

Whatever you require in foundry equipment, you can get from us promptly and at prices which are noticeably low—quality considered. Why not send us your inquiries for what you now need? They will be given our careful attention immediately.





Sand Buckets

The Dominion Foundry Supply Co., Limited

Everything for the Foundry

MONTREAL TORONTO WINNIPEG

Exterior view of Bridgeport Brass Company's new casting shop.

We Consider the Foundry as a Machine

And lay it out accordingly.

Every bit of extra labor in walking or handling material adds to the cost of your castings.

Every dollar invested in building or equipment beyond what is necessary costs you money in uncalled for depreciation and lost interest.

On the other hand, flimsy structures which do not squarely meet your requirements, or lack of proper equipment, also unnecessarily increase the cost of your product.

Our business is designing real foundries for producing castings of quality at the lowest possible cost.

If you have any problems or are contemplating building in the near future, get in touch with us. It will certainly pay you.

THE H. M. LANE COMPANY

Industrial Engineers and Foundry Specialists

OWEN BUILDING, DETROIT, MICH.

Canadian Office: The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.

The Old Era of Working & Saving Must Return

—Some Call it the New Era—

The new era will demand the highest efficiency and whether your foundry executives are college graduates or practical foundrymen, it is essential that they know what McLain learned by years of experience and research work.

When the shop is full of orders and you can name your own price, you need not worry about efficiency, but in times like these MAKE EVERY DOLLAR COUNT —aim to make EVERY CASTING a good one.

If the actual waste were converted into money, it would stagger—

YOU who are directly responsible for this waste,
YOU who are responsible for quality castings,
YOU who are responsible for dividends.

NOW IS THE TIME TO INVESTIGATE THIS WASTE—PREVENT EXCESS COKE BEING CHARGED—USE CHEAPER MATERIALS—and PRODUCE BETTER CASTINGS.

McLAIN'S SEMI-STEEL is the best asset in the foundry business today. Engineers and machine shop owners are specifying it for every casting requiring strength, machinability, hydraulic or other tests, as it is cheaper and 20 to 30 per cent stronger than gray iron.

McLAIN'S SYSTEM gives you complete advice on the mixing of iron by analysis—cupola practice and the making of real semi-steel.

Foundry owners, managers, superintendents, foremen and molders—in fact any man connected with the foundry business—should know McLAIN'S SYSTEM.

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SLY SAND BLAST EQUIPMENT "UP - TO - DATE"

No. 4 Sandblast Barrel

Tilted Type - - - Five Sizes
SANDBLAST BARRELS

Ideally adapted for cleaning small work and extensively used for forgings, stampings, grey iron, brass, bronze and aluminum castings. Most intricate work can be cleaned successfully, as owing to the tilted position of the barrel, revolving at an incline, in connection with the conical bottom plate, the work is turned at such various angles that all parts and surfaces are exposed to the blast.

These mills can be had in five separate sizes, ranging from 14″ to 36″ in diameter, and from 16″ to 36″ in depth.

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Main Office and Works:

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The SLY Line of up-to-date Foundry Equipment

Steel Tumbling Mills
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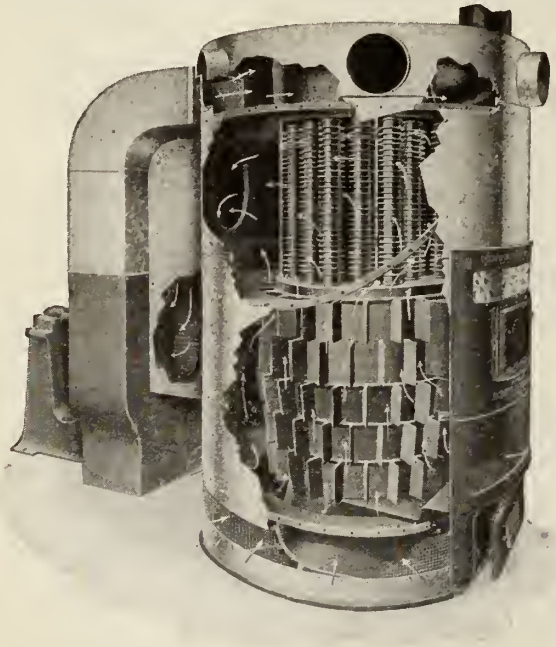
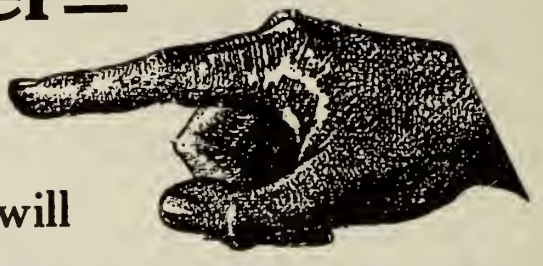
Exhaust Fans
Sand Blast Rooms and Blast Cabinet
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers

Here is the Heater—



The Multivane Fan forces heat near the floor.



that will

CUT YOUR COAL BILLS IN TWO!

If you investigate your plant you'll find that the heat quickly rises to the ceiling or skylight and is wasted As a result from one-half to four-fifths of the coal used is a dead loss. The MECHANICAL HOT BLAST HEATER overcomes this deficiency found in most heaters. It employs a different principle and forces warm, moist air horizontally near the floor level, in the **direction needed.** A multivane fan distributes the heat **direct** to the proper spot. This results in a tremendous saving in coal—a saving that is especially important in this period of sky-high coal prices. Will burn economically bituminous or anthracite coal, coke, oil or gas.

It will pay you to write for the complete facts.

858 Dupont St. Toronto, Ont. **THE E. J. WOODISON CO. LIMITED** 261 Wellington St. W. Montreal, Que.

Manufacturers in Canada of the Robt. Gordon Mechanical Hot Blast Heater

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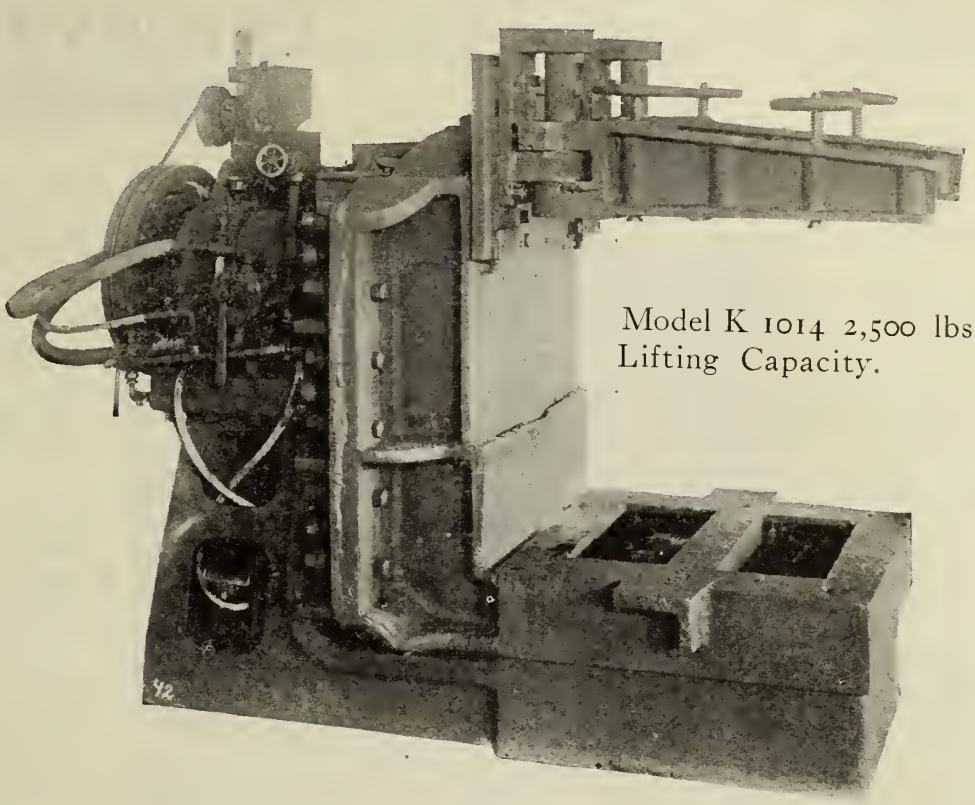
Rollover Molding Machines



Model K 1014 2,500 lbs
Lifting Capacity.

Producing Better Castings For Less Money

The days of careless buying are over. The manufacturer of to-day has to be shown that what he is buying is the best at a reasonable price. We can guarantee both of these and would like to be given an opportunity to prove it to you. Catalogues and full details sent on request.

Simplicity of design; ease of operation; low installation; no pits to clean; entirely above the floor; little space required—Investigate.

Grimes are made in many different types in both hand and power models up to 5,000 lbs. capacity, for use on a wide variety of work.

Write for catalogue and full details of these labor and time saving machines.

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When Abraham Lincoln was asked how long a man's legs ought to be he replied—"Long enough to reach to the ground."

Now this is logic.

When you foundrymen ask yourselves how much you should pay for equipment will not your answer be—

"Just enough to obtain the very best, including a reasonable profit for the manufacturer. *But not* an endless string of middlemen's profits, duties, taxes, etc."

This also is logic—foundry logic. The kind of logic you can put into effect the moment you send us your first order.

Take a look at the supplies listed below. Then get our prices on them. A comparison will show that you can make savings mounting from 30 per cent. to as much as 75 per cent.

Ladle Bowls and Shanks
Steel Bands
Steel Slip-over Jackets
Steel Core Plates
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All-Steel Core Ovens

Don't wait until tomorrow. Now is the time to get our prices and liberal discounts.

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Manufacturing and Welding Co.

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MOULDING SAND
In Canada
From the Government Tested
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THIS sand has been used since 1912 in leading foundries in Canada, and city of Detroit, and most favorably reported on.
For analysis and tests by the Mines Branch of the Dominion Government refer to Bulletin No. 21, 1917, where our Sand is placed in actual Foundry tests with Albany Sand and highly recommended.

On account of demand this Season for our Sands we are placing a practical Moulder, an expert on grading sands, in charge on June 10th, and will guarantee every car shipped to our customers, satisfactory, or will make no charges. Is this not a fair proposition?

Send us your requirements, stating class of work—Brass, Aluminum, Malleable, Stove Plate, Etc., and we will quote you a special June and July price.

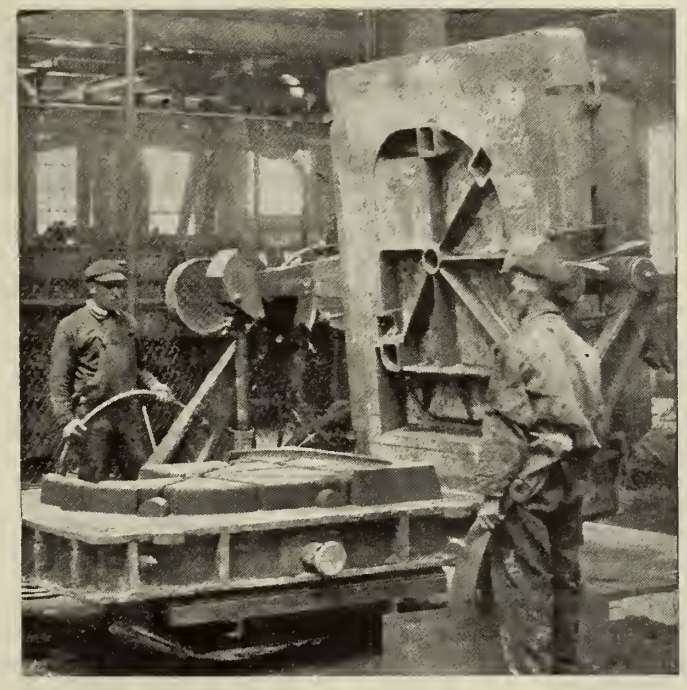
We want you as a satisfied customer, and will give you prompt delivery and excellent grade of Sand. Write today.

THE BROCKVILLE MOULDING SAND CO.
LIMITED.

Brockville, Ont.

If It's a Herman, It's Worth Using
It Made Its Way by the Way It's Made

Our plant is equipped and the design of our Jarr Independent Rollover and Pattern Drawing Machines is such to take care of your work of a medium or larger nature.



We will be thankful if you will send us your enquiry and let our Service Department advise with you on your molding machine requirements for such work.

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GENERAL OFFICES: Union Bank Building, PITTSBURGH, PA.

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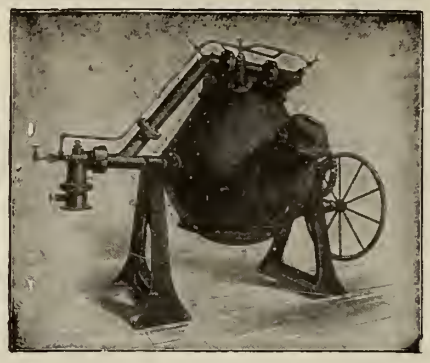
BETTER melts, in less time and at lower costs, are the results that go with Hawley - Schwartz Melting Furnaces. They are economy producers in every sense.



The Perfect Melter

THE Hawley - Schwartz heats uniformly and will handle all metal from 50 lbs. to 10,000 lbs.

Write for catalogue and complete information.

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TABOR
3-inch Plain Jarring Machine For Small Molds And Medium Sized Cores

3" Tabor Jarring Machine with 12" x 14" Table

A Necessity in Every Foundry

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THE TABOR MFG. COMPANY

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MASTER FLASK

This is the handy Flask that up-to-date Foundries use for faster, better work. The "Diamond" trade-mark protects you and is your guarantee of quality.

MASTER FEATURES

Master Flasks are accurate, light in weight, and easy to handle.
Master Flasks are Speedy and durable.
They are wonderful economizers of floor space.

Specify "Diamond" next time.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Blystone Mfg. Co., Cambridge Springs, Pa.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip Co., Akron, O.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Scarfe & Co., Ltd., Brantford, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE SAND
Venango Sand Co., Franklin, Pa.

CORE SAND MIXER
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip Co., Akron, O.

CORE SAND MIXERS AND SANO MIXING AND COMPOUND MILLS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Hamilton.
Joseph Dixon Crucible Co., Jersey City, N.J.
National Engineering Co., Chicago, Ill.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto Ont.

CORE REDUCERS
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE TAPERING AND CUTTING-OFF CORE TESTING MACHINE
The American Foundry Equipment Co., New York City.
National Engineering Co., Chicago, Ill.

CORE WAX
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CUTTERS, CORE
Wadsworth Core Machine & Equip. Co., Akron, O.

CRANES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Mussens, Ltd., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES
J. H. Gautier Co., Jersey City, U.S.A.
Frederic B. Stevens, Detroit, Mich.
Woodison Co., E. J., Toronto, Ont.

CUPOLAS
Bailey & Bell Fire Brick Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd.,Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co, Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Dominion Foundry Supply Co., Ltd. Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
W. W. Welis, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City,, N.J.
Woodison, E. J., Co., Toronto, Ont.

DOWEL PINS
Diamond Camp and Flask Co.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

DRAWBAR CENTERING DEVICE
Holden Co., Ltd., The, Montreal.

DRILLS, ELECTRIC AND PORTABLE
Independent Pneumatic Tool Co., Chicago, Ill.

DRINKING FOUNTAINS
Crane Ltd., Montreal.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md

DRYING OVENS FOR CORES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Monarch Engineering Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
The American Foundry Equipment Co., New York City.
Skinner Bros. Mfg. Co., St. Louis, Mo
Pangborn Corporaton, Hagerstown, Md
Sly, W. W., Mfg. Co., The, Cleveland, O
Woodison, E. J., Co., Toronto, Ont.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md

DUST EXHAUSTER, ANISTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.
Monarch Engineering & Mfg. Co, Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

ELECTRIC FURNACES
Electric Furnace Construction Co.

ELECTRIC GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

ELECTRIC TOOLS
Holden Co., Ltd., The, Montreal.

ELECTRIC STEEL FURNACES
Electric Furnace Construction Co., Philadelphia, Pa.

ELEVATORS, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Foundry Supply Co, Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Ham ilton, Ont.
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

ENAMELWARE
Crane Ltd., Montreal.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINEERS, CONSULTING
H. M. Lane Co., Ltd., Detroit, Mich.

ENGINEERS (FOUNDRY)
H. M. Lane Co., The
Osborn Engineering Co., Cleveland, O.

EQUIPMENT, CORE ROOM
Wadsworth Core Machine & Equip. Co., Akron, O.

FACINGS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Mich.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J. & Co., Toronto, Ont.

FACING SAND MIXER
National Engineering Co., Chicago, Ill.

FACING SAND MIXERS AND SAND MIXING AND COMPOUNDING MILLS
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip. Co., Akron, O.

FANS, EXHAUST
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FERRO-ALLOYS
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-MANGANESE
A. C. Leslie & Co., Ltd., Montreal, Que.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Que.

FILLERS (METALLIC)
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Frederic B. Stevens, Detroit, Mich.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J. Co., Toronto, Ont,

FILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

FIRE BRICK AND CLAY
Bailey & Bell Fire Brick Co., Toronto, Ont.
A. C. Leslie & Co., Ltd., Montreal, Que.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Frederic B. Stevens, Detroit, Mich.
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FIRE CEMENT
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

FIRE SAND
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Frederic B. Stevens, Detroit, Mich.
Pettinos, George F., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FITTINGS
Crane Ltd., Montreal.

FLASK FITTINGS
Diamond Clamp & Flask Co.

FLASK PINS
Sterling Wheelbarrow Co., Milwaukee.

FLASKS, SNAP, ETC.
The American Foundry Equipment Co., New York City.
Diamond Clamp & Flask Co.
Hamilton Facing Mill Co., Hamilton, Ont.
Muasens, Ltd., Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Sterling Wheelbarrow Co., Milwaukee.
Tabor Mfg. Co., Philadelphia, Pa.

FOUNDRY COKE
Frederic B. Stevens, Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY EQUIPMENT
The American Foundry Equipment Co., New York City.
Damp Bros. Mfg. & Weld Co., Toronto.
Diamond Clamp and Flask Co.
Frederic B. Stevens, Detroit, Mich.
Mussens, Ltd., Montreal, Que.
National Engineering Co., Chicago, Ill.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY FACINGS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY GRAVEL
Frederic B. Stevens, Detroit, Mich.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

FOUNDRY MIXERS
The American Foundry Equipment Co., New York City.
National Engineering Co., Chicago, Ill.

FOUNDRY PARTING
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros Co.., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FOUNORY PRACTICE
McLain's System, Inc., Milwaukee, Wis.

FOUNDRY RIDDLES
Blystone Mfg. Co., Cambridge Springs, Pa.

FOUNDRY SUPPLIES
Sterling Wheelbarrow Co., Milwaukee.
Blystone Mfg. Co., Cambridge Springs, Pa.
Frederic B. Stevens, Detroit, Mich.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

FURNACE LINING
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Penn.
Woodison, E. J. Co., Toronto, Ont.

FURNACES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Electric Furnace Construction Co.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Penn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich
Whitehead Bros., Co., Buffalo, N. Y.
Woodison, E. J. Co., Toronto, Ont.

FURNACES, BRASS
Campbell-Hausfeld Co., Harrison, Ohio.
Volta Mfg. Co., Welland.

FURNACES, ELECTRIC
Electric Furnace Construction Co.

GLOVES
ASBESTOS, DUCK AND LEATHER
Frederic B. Stevens, Detroit, Mich.

GOGGLES
King Optical Co., Cleveland, O.

GRAND ROTARY SAND RIDDLE
GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE PRODUCTS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

GRINDERS, CORE
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
Wadsworth Core Machine & Equip. Co., Akron, Ohio.

GRINOERS, PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The,
Holden Co., Ltd., The, Montreal.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Mich.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING PANS
National Engineering Co., Chicago, Ill.

GRINOING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT ANGULAR
Pangborn Corporation, Hagerstown, Md. U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT STEEL
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEATING
Skinner Bros. Mfg. Co., St. Louis, Mo.

HOISTS, CHAIN AND PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

HOISTS, HAND, TROLLEY
Northern Crane Works, Walkerville.

HOT BLAST HEATERS
E. J. Woodison Co., Toronto, Ont.

INDUSTRIAL ENGINEERS
H. M. Lane Co., Ltd., Detroit, Mich.

IRON CEMENTS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

IRON FILLER
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Woodison, E. J. Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOLT MACHINES AND SQUEEZERS
The American Foundry Equipment Co., New York City.
Grimes Molding Machine Co., Detroit, Mich.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.

KNIFE GRINOERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
Damp Bros. Mfg. & Weld Co., Toronto.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J. Co., Toronto, Ont.

LADLE HEATERS
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
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Frederic B. Stevens, Detroit, Mich.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J. Co., Toronto, Ont.

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Obermayer & Co., S., Chicago, Ill.
Reynolds & Co., Toronto.

LUBRICATING GRAPHITE
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Pettinos, George F., Philadelphia, Pa.

MACHINE TOOLS
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETIC SEPARATORS
Ding's Magnetic Separator Co., Milwaukee, Wis.
Oliver Machinery Co., Grand Rapids, Mich.

METALLURGISTS
Charles C. Kawin Co., Toronto.
McLain's System, Inc., Milwaukee, Wis.
Toronto Testing Laboratories, Toronto.

MILLS, SAND MIXING AND COMPOUNDING
National Engineering Co., Chicago, Ill.

MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

MICA SCHIST
Frederic B. Stevens, Detroit, Mich.
Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
National Engineering Co., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

MIXERS
The American Foundry Equipment Co., New York City.
National Engineering Co., Chicago, Ill.

MOLDERS' TOOLS
Dominion Foundry Supply Company, Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
The American Foundry Equipment Co., New York City.
The Cleveland Osborn Mfg. Co., Cleveland, O.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Hamilton Facing Mill Co., Hamilton, Ont.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND
Benson & Patterson, Stratford, Ont.
Brockville Moulding Sand Co., Ltd., Brockville, Pa.
Woodison, E. J. Co., Toronto, Ont.
Venango Sand Co., Franklin, Pa.

MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.

SAND RAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

NITROGEN
Dom. Oxygen Co., Toronto, Ont.

NOZZLES, SAND BLAST
The American Foundry Equipment Co., New York City.
Frederic B. Stevens, Detroit, Mich.
Panghorn Corporation, Hagerstown, Md., U.S.A.

NORTH RIVER SAND
Pettinos, George F., Philadelphia, Pa.

OIL AND GAS FURNACES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

OILSTONE GRINOERS
Oliver Machinery Co., Grand Rapids, Mich.

OPEN HEARTHS
OVENS FOR CORE-BAKING AND DRYING
Monarch Engineering & Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.

OXY-ACETYLENE AND OXY-HYDROGEN WELDING AND CUTTING EQUIPMENTS
Holden Co., Ltd., The, Montreal.

OXYGEN
Dom. Oxygen Co., Toronto, Ont.

PANS, WET AND DRY
National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.

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Downer Pattern Works, Toronto, Ont.
Hamilton Pattern Works, Toronto, Ont.
Modern Pattern & Machine Co., Ford City, Ont.

PATTERN MAKERS' BENCHES
Diamond Clamp & Flask Co.
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machy. Co., Preston, Ont.

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Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP MACHINERY
Preston Woodworking Machinery Co., The

PATTERN WAX
United Compound Co., Buffalo, N.Y.

PIG IRON
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Steel Co. of Canada, Hamilton, Ont.

PIG IRON BARROWS
Sterling Wheelbarrow Co., Milwaukee.

PIPE, BLACK AND GALVANIZED
Crane Ltd., Montreal.

PIPE JOINTS COMPOUNDS
Crane Ltd., Montreal.

PHOSPHORIZERS
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Joseph Dixon Crucible Co., Jersey City, N.J.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

PLATES, STEEL BOTTOM SNAP FLASK
Wadsworth Core Machine & Equip. Co., Akron, O.

PLATES, STEEL CORE DRYING
Wadsworth Core Machine & Equip. Co., Akron, O.

PLUMBAGO
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilon Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Pettinos, George F., Philadelphia, Pa.

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Holden Co., Ltd., The, Montreal.

PNEUMATIC TOOLS
Independent Pneumatic Tool Co., Montreal, Que.
The Holden Co., Ltd., Montreal.
Keller Pneumatic Tool Co., Grand Haven, Mich.

PNEUMATIC WINCHES
Holden Co., Ltd., The, Montreal.

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Crane Ltd., Montreal.

PRODUCTION LATHES
Oliver Machinery Co., Grand Rapids Mich.

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Diamond Clamp & Flask Co.

RAMMERS, PNEUMATIC
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Joseph Dixon Crucible Co., Jersey City, N.J.
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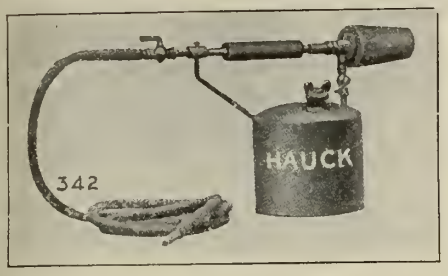

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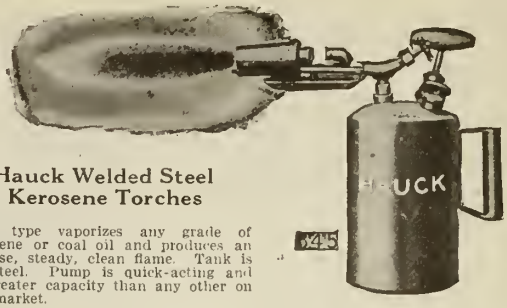

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This type vaporizes any grade of kerosene or coal oil and produces an intense, steady, clean flame. Tank is all steel. Pump is quick-acting and of greater capacity than any other on the market.

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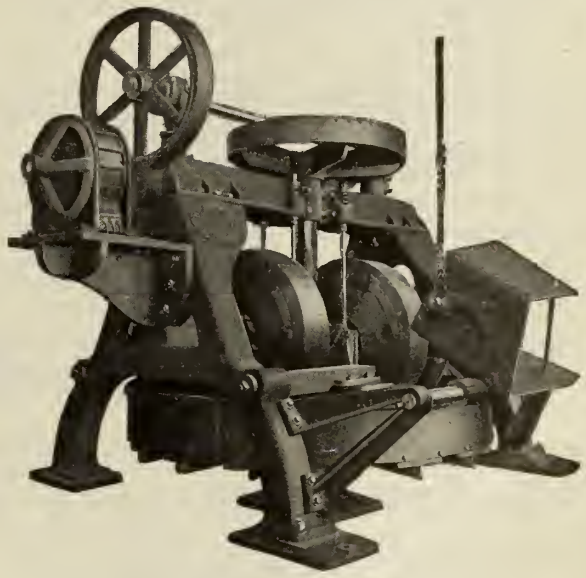
Frost

Wet Pan Sand Mill

for Steel Foundries



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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Mussens, Ltd., Montreal, Que.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES, ELECTRIC
Frederic B. Stevens, Detroit, Mich.
Preston Woodworking Machinery Co., Preston, Ont.
Woodison Co., E. J., Toronto.

RESIN
Dominion Foundry Supply Co., Ltd Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Reynolds & Co., Toronto.
Scarfe & Co., Ltd., Bantford, Ont.
Sly, W. W., Mfg. Co., Tbe, Cleveland, O.
Woodison, E. J. Co., Toronto, Ont.

RIVETERS, PNEUMATIC HYDRAULIC HAMMER, CDMPRESSIDN
Independent Pneumantic Tool Co., Chicago, Ill.

ROCK DRILLS
Holden Co., Ltd., The, Montreal.
Osborn Mfg. Co., Cleveland, Ohio.

RIP SAWS
Preston Woodworking Machinery, Co., The.

ROUGE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

SAND MILLS
Blystone Mfg. Co., Cambridge Springs, Pa.
Frost Mfg. Co., Chicago, Ill.
Frederic B. Stevens, Detroit, Micbigan.
National Engineering Co., Chicago, Ill.
Woodison. E. J., Toronto.

SAND BLAST
Mussens, Ltd., Montreal, Que.

SANDBLAST ABRASIVES
Frederic B. Stevens, Detrolt, Mich.
Pangborn Corporation, Hagerstown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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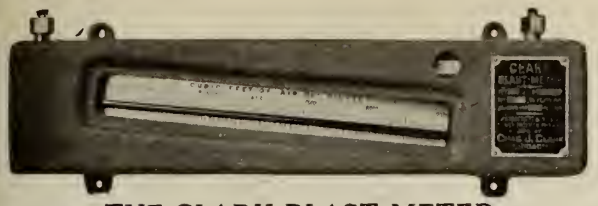

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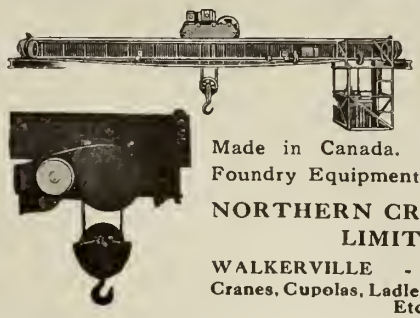

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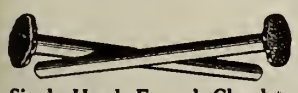

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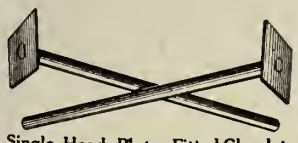

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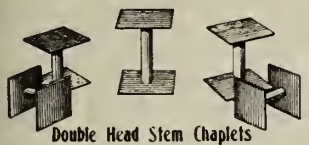

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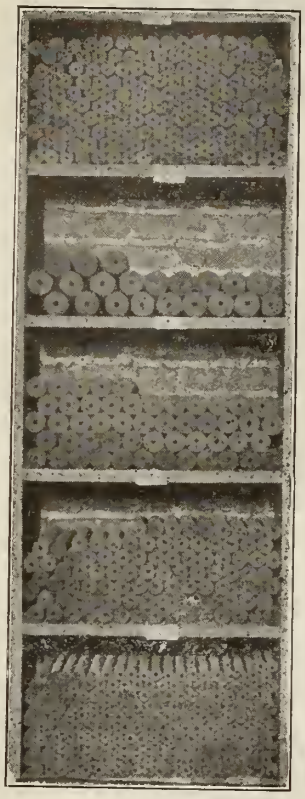

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But when the mere turning of a crank means a perfect, seamless, vented core, think of the possibilities for better efficiency and quality with lower production costs in a core-room like your own, for instance.

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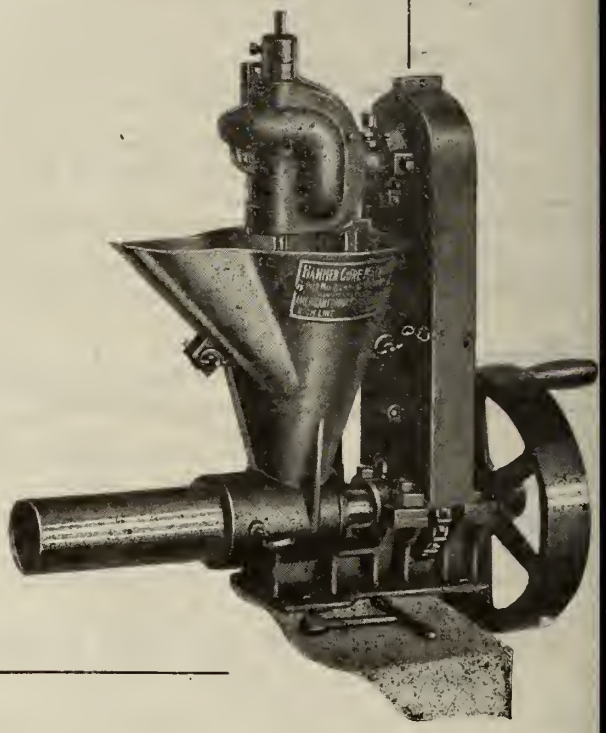

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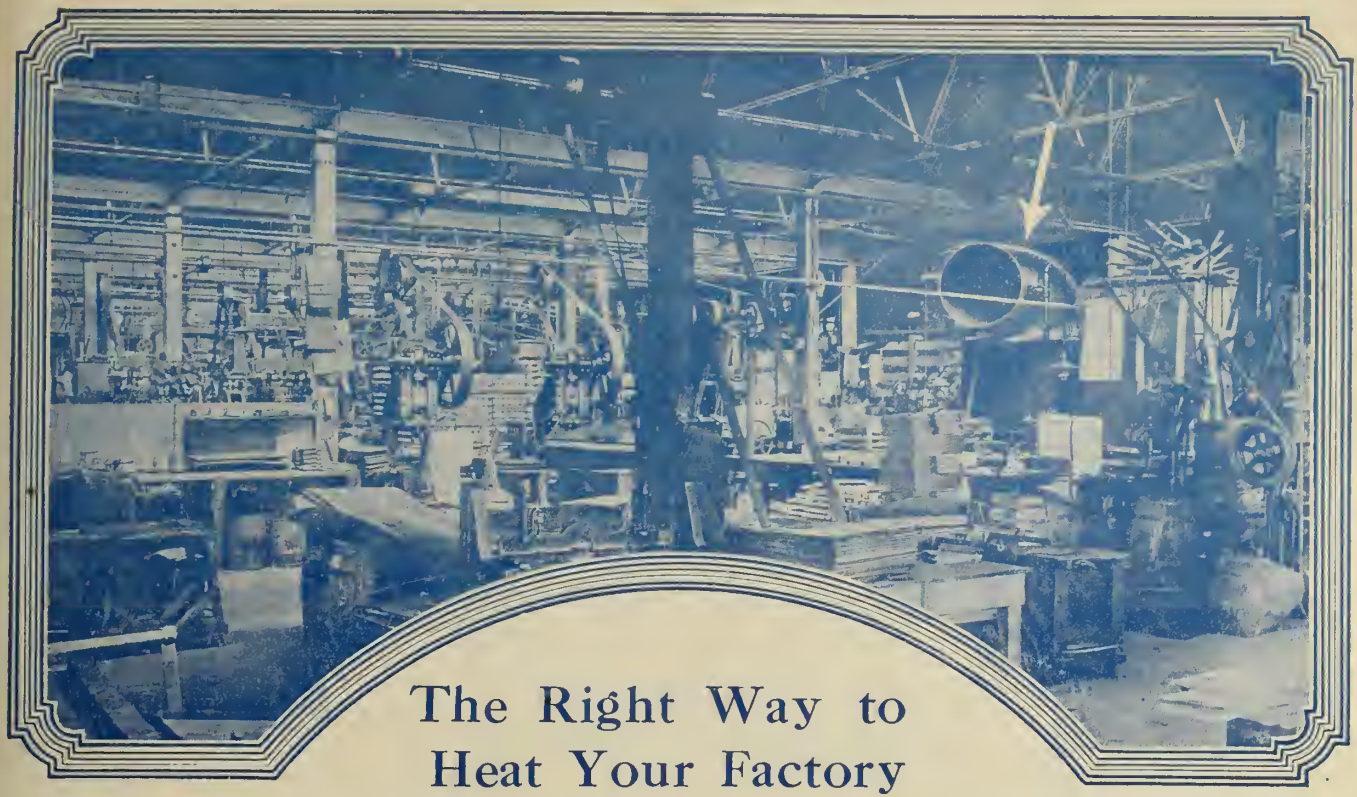

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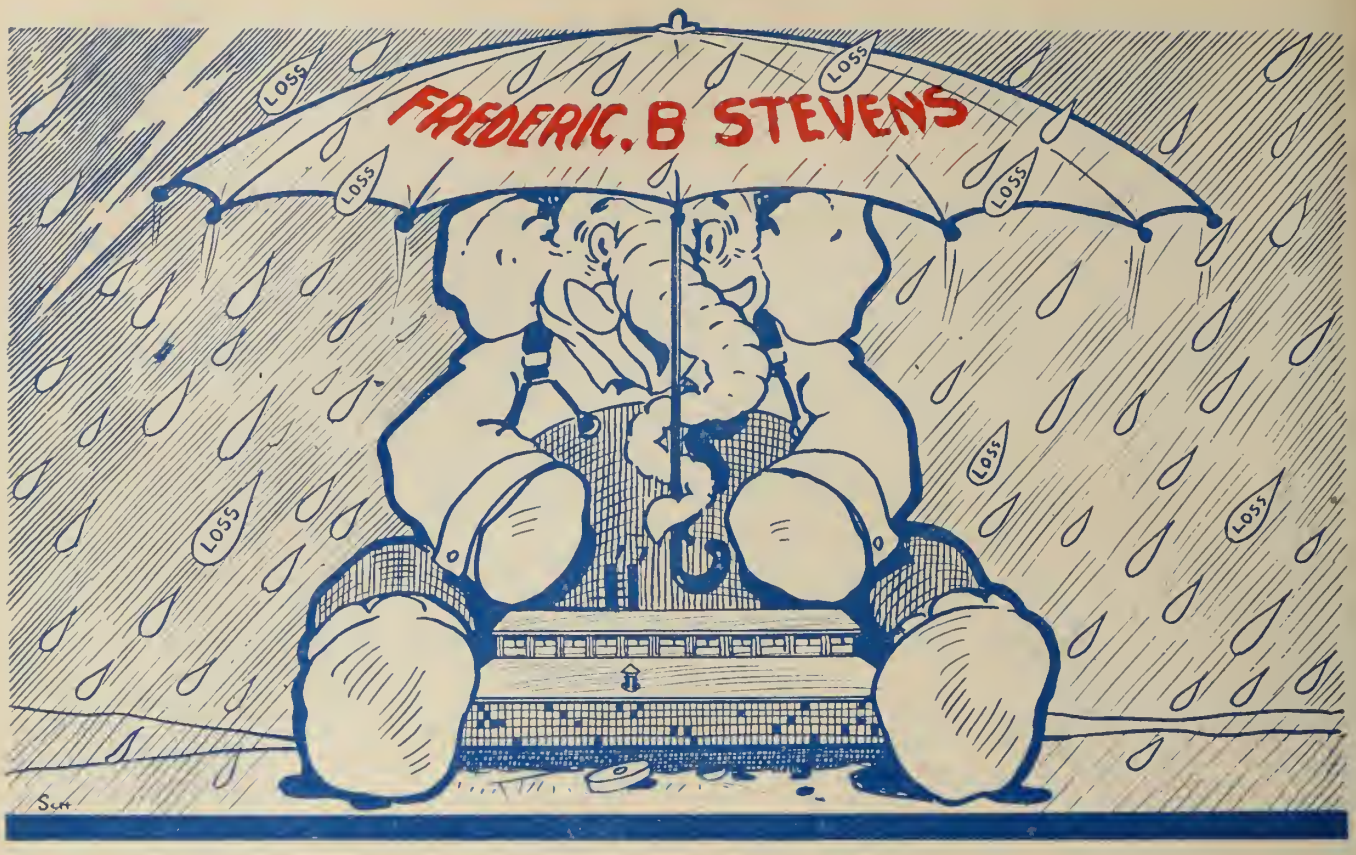

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This time it comes from the executive end—from the office.

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METAL INDUSTRY NEWS

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Vol. XII | Publication Office, Toronto, September, 1921 | No. 9

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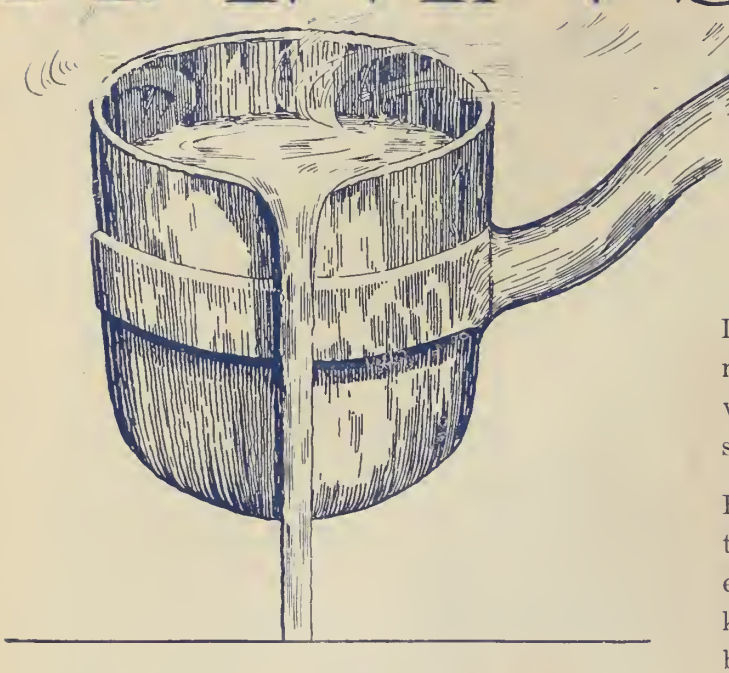

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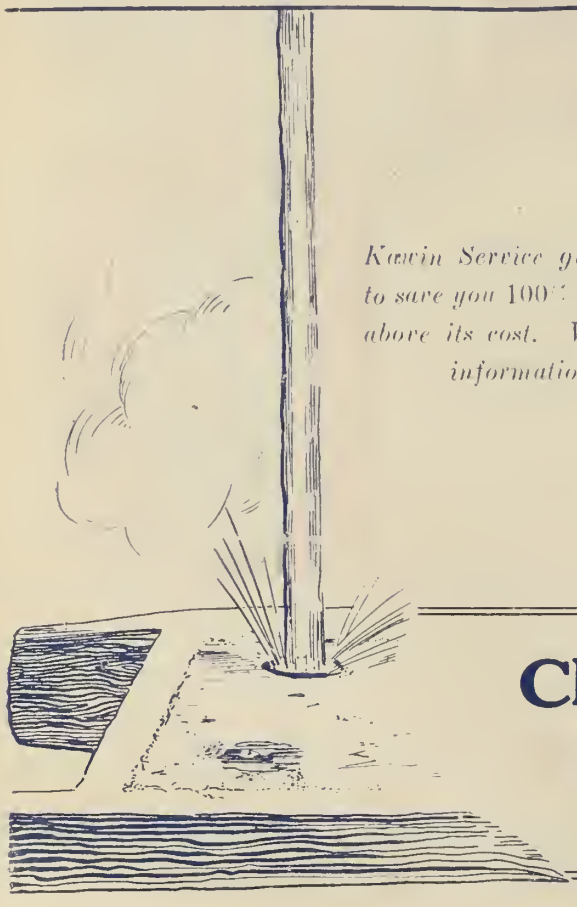
You may be a molder—and a good one. I may be a chemist—and a good one.
But you are still a molder and I a chemist.

If you could give me ALL your knowledge of molding I would be a very valuable man. For I would then have COMPLETE knowledge of two specific things.

But this, of course, is impossible. The capacity of the human brain is not sufficiently large. Yet every day you are faced with the necessity of knowing ALL ABOUT not only one or two things but a great many. You want to know where to purchase the most desirable raw materials. You want the chemical analysis of same. You want to know how to successfully use less desirable materials if necessary. You want to know the most up-to-date cupola practice. You want to know how you can link up with the Machine Shop to make bigger profits.

From what single source can you obtain all this and much more needed information? Ask KAWIN. KAWIN SERVICE is an organization of Foundry Specialists ready to help you increase your profits.

If You are a Molder- You're not a Chemist



Kawin Service guarantees to save you 100% over and above its cost. Write for information

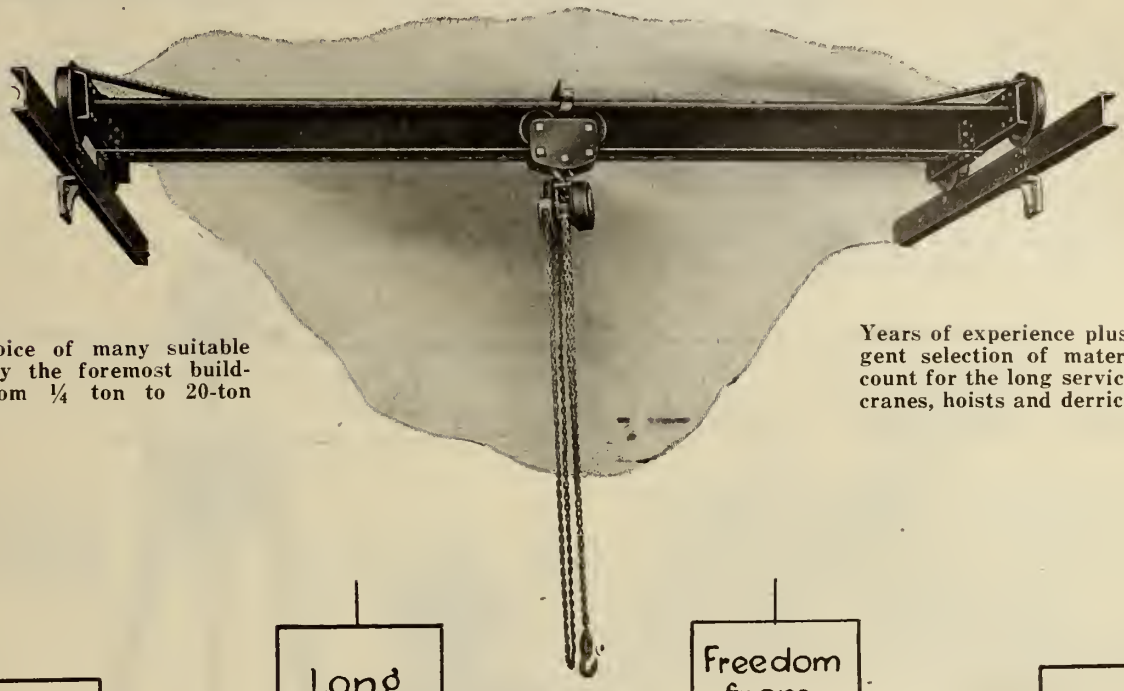
Charles C. Kawin Company

307 Kent Building, Toronto

Chicago, Ill. Cincinnati, O. Buffalo, N.Y. San Francisco, Cal.

Chemists--Metallurgists
Foundry Engineers

Profitable Foundry Equipment.



Your choice of many suitable styles, by the foremost builders. From ¼ ton to 20-ton capacity.

Years of experience plus intelligent selection of materials account for the long service of our cranes, hoists and derricks.

Reasonable Initial Cost.

Long Life

Freedom from Repairs

After Sale Service

Efficient Operation

Guard Your Profits with our Cranes, Trolleys and Chain Blocks

Isn't it a fact that a big percentage of your men's time is taken up with lifting and moving their work into place?
Doesn't this mean that your profits are slipping slowly but surely away from you?
Give your men a reliable, labor-saving helper—one that works for practically nothing—one that keeps your profits in the bank.
We have a line of Single and Double I-Beam Cranes in sizes for every foundry. Send blueprints for quotations.

Get our prices on Fire Brick, Cupola Blocks, Fire Clay, Heat Proof Cement, Foundry Facings, Hardwood, Steel Bands, Standard Core Ovens, Supplies and equipment of all kinds.

The E. J. Woodison Company, Limited

Foundry Requisites, Firebrick, Fireclay and Equipment

Toronto, Ontario

Branch Warehouse: 261 Wellington St. Montreal, Que.

Combs Gyratory Foundry Riddle

Carry it to your work—turn the switch—Presto!

These are all the motions necessary with the Combs Gyratory Sand Riddle. It is the only really portable riddle made. Weighing but ninety pounds a man can easily carry it where needed, or if desired it can be run on a wire cable stretched parallel with a line of moulders. Either way the Combs Gyratory Riddle represents a big deduction from screening time with better mixtures thrown into the bargain.

Equals ten hand riddles!

This cost cutting machine will sift sand faster than one man can shovel into it and will screen more sand than ten labourers using hand riddles. The simple, compact construction and gyratory motion cuts repair bills while the one-sixth horse power Motor makes the cost of current practically negligible.

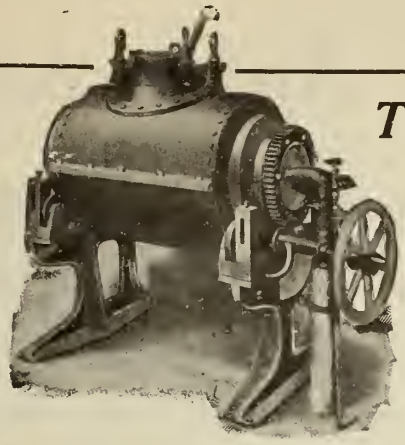
This type V Combs Gyratory Riddle is now made in Toronto, Canada. You buy the product of Canadian workmen and pay for it in Canadian Dollars. For particulars write direct to

The Great Western Mfg., Co.
Leavenworth, Kansas

Mixes as well as Sifts.
Reduces Moulding time.
Increases the output of each man.
Riddles sand right where wanted.
Operated on little power.

Run One Chamber Off while the other Is Melting

This utilizing of "all the heat" enables the Monarch Double Melting Furnace to melt almost twice as much metal as any other furnace without additional cost for fuel. It is **"2 furnaces in 1"** occupying little space and each chamber has its **own independent burner.**



The Simplex

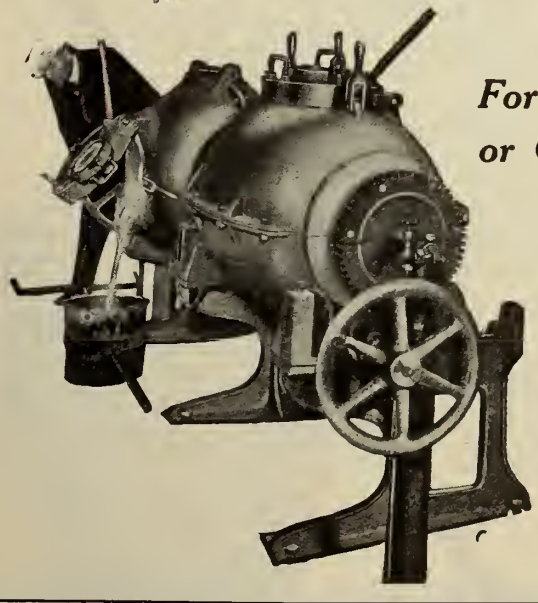
Single Chamber Melting Furnace is built on the same lines as a Double-Chamber Furnace, but without its continuous heating capacity. Still the fastest Melter and best Fuel Economizer of its kind.

MONARCH

Lightning Fast

Double Chamber Melting

FURNACE



For Oil or Gas

—is 50 per cent. more economical than any other furnace for melting copper, brass, aluminum, iron, steel, gold, silver, etc. No oxidizing can take place because the flame **is not directed** against the metal. And you can melt the **same kind or different metals.**

Scores of foundries have boosted their daily output by the use of this Speedy Melter. Our catalog will show you what others are saving. **Get a copy now.**

The Monarch Engineering & Mfg. Company

1206 American Bldg., Baltimore, Md.

Shops at Curtis Bay, Md.

Announcement

I. JOHNSON & SON LIMITED, *Pattern Makers*

Entering Foundry Supply Business

Canada's largest and best equipped Pattern Works announce their intention of entering the foundry supply business as regards Wooden Equipment.

Supplied most of the Wooden Equipment in Grinell's Foundry.

Will take care of all special requirements in highest class lumber, woodwork, etc.

Expert Pattern Making
in Wood and Metal
Gate and Plate Work

Buy
Made in Canada
Products

Let Us Know Your Needs for
Snap Flasks
Spruce Moulding Flasks
Hardwood Mallets
Wedges
Hardwood Bench Rammers

I. JOHNSON & SON LIMITED

1536 Dundas St., TORONTO. Phone P. 4475

VENT WAX

BUFFALO BRAND

Eliminates "blowing" of cores

No wires or cords to loosen the sand. Absorb by the heat, leaving a clean, unobstructed vent hole. Buy it at your supply house.

United Compound Co.
28 ELK ST., BUFFALO.

DIXON CRUCIBLES

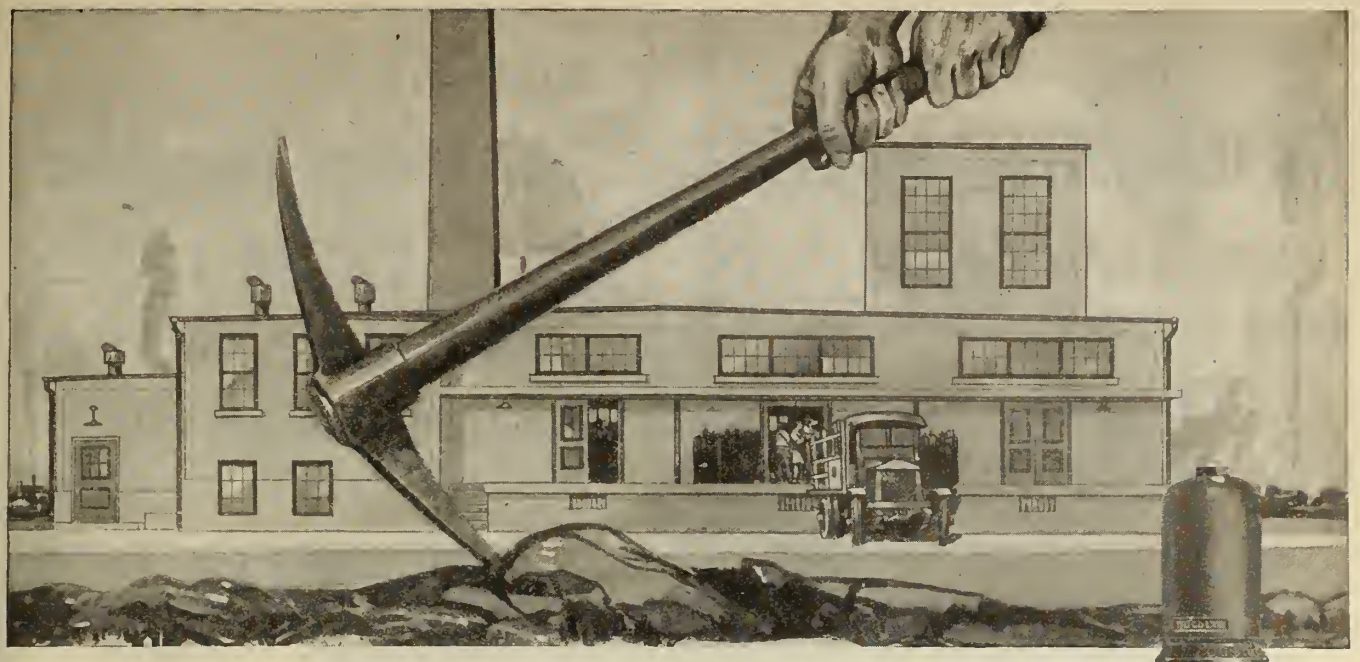
From graphite mine to finished crucible, the entire process is in the hands of Dixon operatives, many of whom have made the manufacture of Dixon Crucibles their life-work.

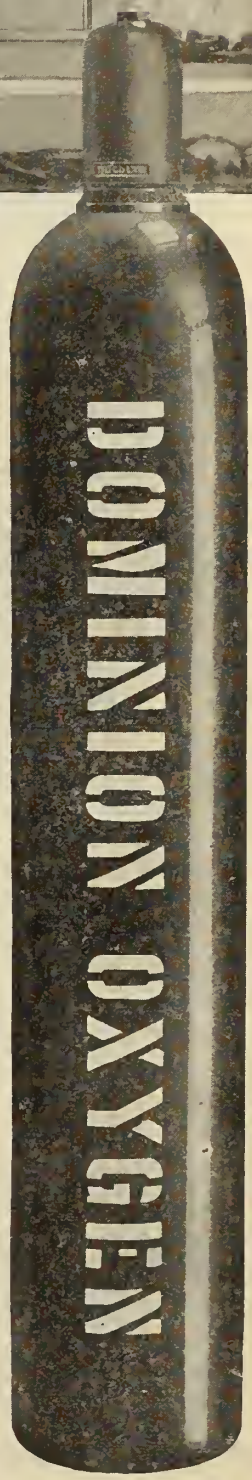
Each crucible that bears the name DIXON carries the endorsement of an organization which has been through every stage of crucible evolution.

Write for Booklet No. 27A.

Joseph Dixon Crucible Co.
Jersey City, N. J. U.S.A.
Established 1827

Canadian Agent:
Canadian Asbestos Co.
60 Front St. West
TORONTO





Building for Bigger Business

DOMINION OXYGEN has won such preference everywhere in Canada that the Dominion Oxygen Company Limited is constructing another plant with all possible speed at Montreal.

This manufacturing unit will have a producing capacity again as large as that of our plant in Toronto, and will provide facilities for even quicker and better service than heretofore.

With twice the output of this uniformly pure oxygen to take care of constantly increasing demands, ample reserves will be maintained at all times at our various distributing stations to insure immediate supply for your needs — whether you require one cylinder or hundreds.

No matter where your location—at nearby industrial centers or miles away on remote and isolated jobs—forward your order to the nearest of our six plants and distributing stations and it will be filled on the day it is received.

Dominion Oxygen Co., Limited

Hillcrest Park, Toronto

Hamilton, Merritton, Montreal, Welland, Windsor.

D21

Buy Your
MOULDING SAND
In Canada
From the Government Tested
Brockville Deposits

THIS sand has been used since 1912 in leading foundries in Canada, and city of Detroit, and most favorably reported on.
For analysis and tests by the Mines Branch of the Dominion Government refer to Bulletin No. 21, 1917, where our Sand is placed in actual Foundry tests with Albany Sand and highly recommended.

On account of demand this Season for our Sands we are placing a practical Moulder, an expert on grading sands, in charge on June 10th, and will guarantee every car shipped to our customers, satisfactory, or will make no charges. Is this not a fair proposition?

Send us your requirements, stating class of work—Brass, Aluminum, Malleable, Stove Plate, Etc., and we will quote you a special June and July price.

We want you as a satisfied customer, and will give you prompt delivery and excellent grade of Sand. Write today.

THE BROCKVILLE MOULDING SAND CO.
LIMITED.

Brockville, Ont.

YOU GET—

Best Prices - Highest Quality - Prompt Deliveries

When You Specify

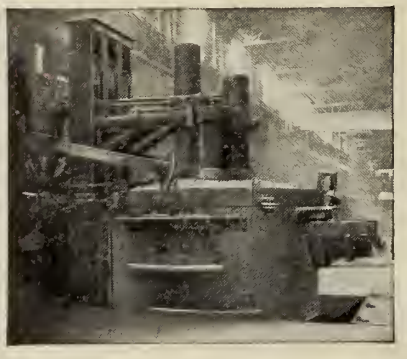
VENANGO
MOLDING SANDS

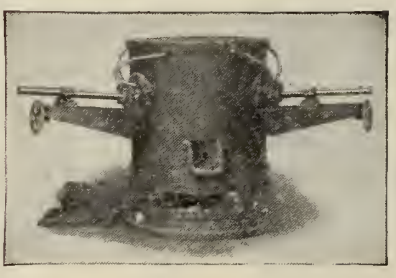
Nowhere else on earth can you obtain molding sands of the same high quality as Venango. Write for samples and see for yourself. Venango service means convenience. You tell us your needs—we guarantee satisfaction.
Don't put it off. Write now.

Sands *for*
Steel
Malleable
Brass
Aluminum
Furnace Light Grey Iron Castings

VENANGO SAND CO.
FRANKLIN, PA.

"VOLTA" Electric Furnaces





Steel Furnaces
100 lbs. to 15 tons capacity.

Grey Iron and Ferro-Alloy Furnaces.
In sizes to suit customer.

Brass Furnaces
Three - Phase, in standard sizes of ⅛, ¼, ½ and 1 ton capacity.

Electric Furnace Accessories of all kinds.

Estimates and General Information cheerfully given.

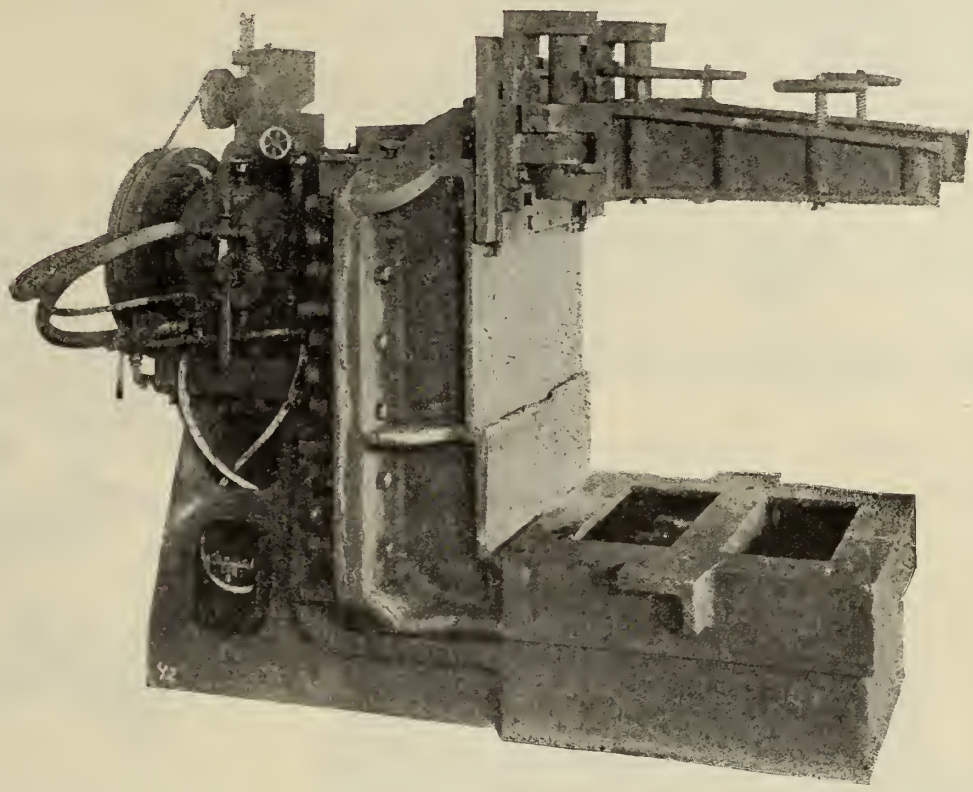
The Volta Manufacturing Company, Ltd.
WELLAND, ONT.

GRIMES ROLLOVER MOLDING MACHINES

are

Labor and time saving machines

Simplicity of design; ease of operation; low installation; no pits to clean; entirely above the floor; little space required — Investigate.



Grimes are made in many different types in both hand and power models up to 5,000 lbs. capacity, for use on a wide variety of work.

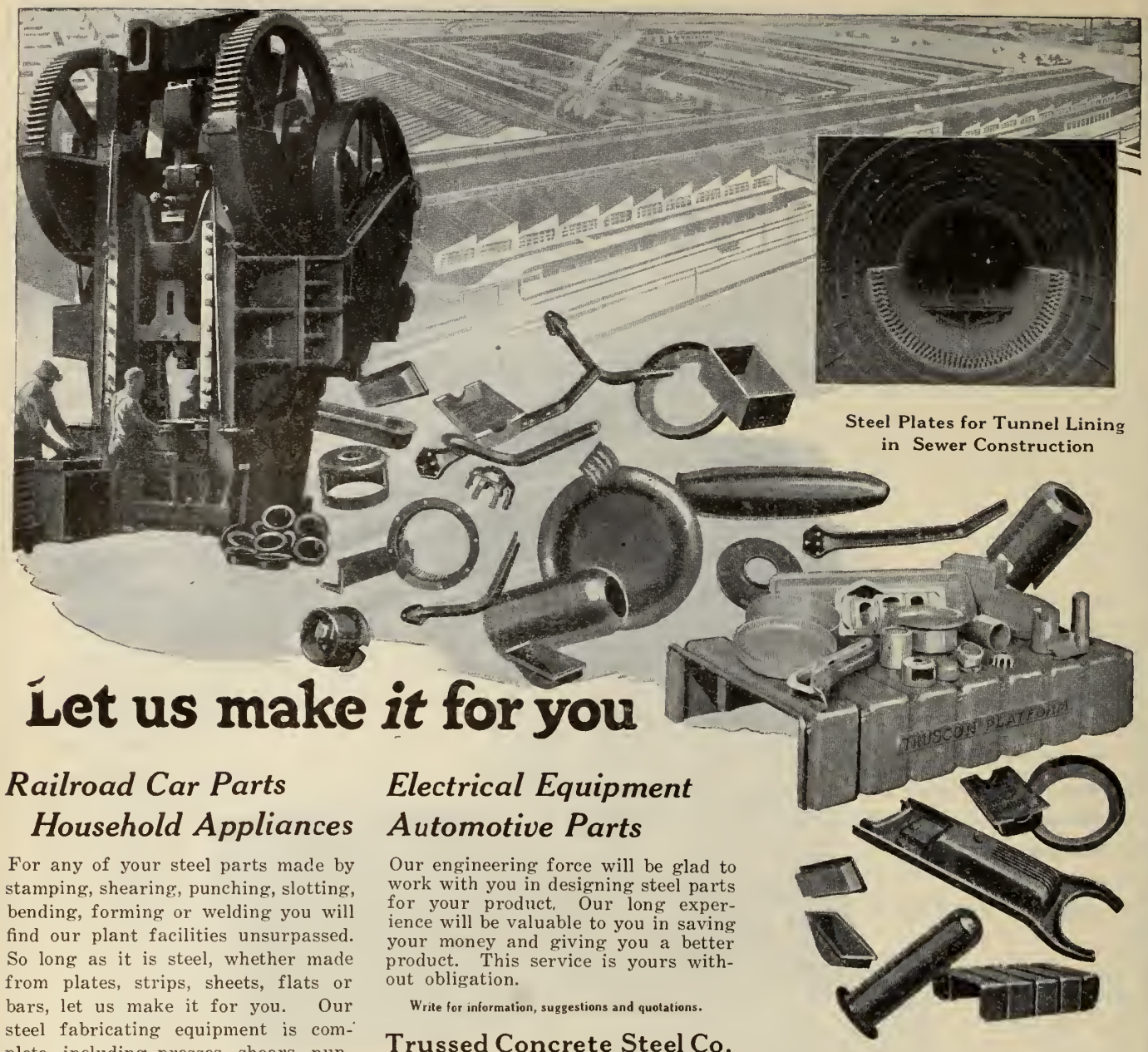
Model K1014 2,500 lbs. Lifting Capacity.

Producing Better Castings For Less Money

These molding machines are producing better castings for less money in many plants today. Are these machines in your plant? If not, give us an opportunity to prove to you that these machines will do all we claim of them. Is it not the best policy to buy the best at the most reasonable price?

Catalogues and full detail of these sterling machines sent on request.

GRIMES MOLDING MACHINE CO.
5736 Hastings St. - - DETROIT, Mich.



Steel Plates for Tunnel Lining in Sewer Construction

Let us make *it* for you

Railroad Car Parts Household Appliances

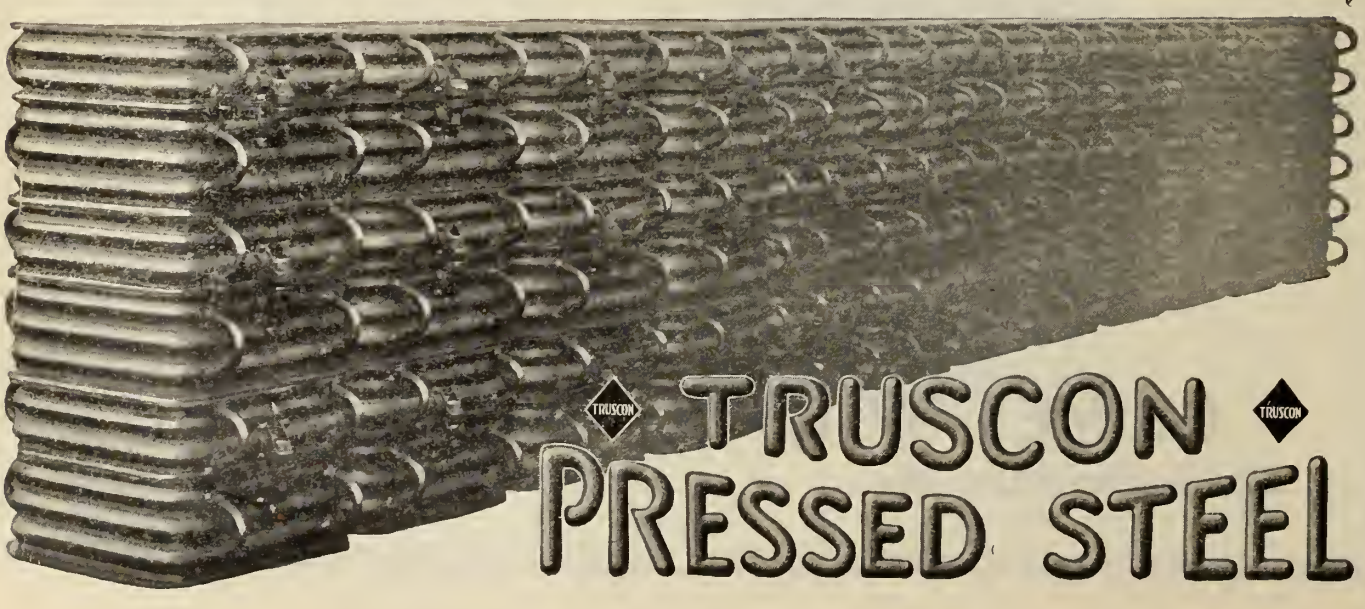
For any of your steel parts made by stamping, shearing, punching, slotting, bending, forming or welding you will find our plant facilities unsurpassed. So long as it is steel, whether made from plates, strips, sheets, flats or bars, let us make it for you. Our steel fabricating equipment is complete, including presses, shears, punches, drills, welders and machine shops for dies.

Electrical Equipment Automotive Parts

Our engineering force will be glad to work with you in designing steel parts for your product. Our long experience will be valuable to you in saving your money and giving you a better product. This service is yours without obligation.

Write for information, suggestions and quotations.

Trussed Concrete Steel Co. of Canada, Ltd.
Walkerville, Ont.



SIMPSON

Intensive Foundry Mixer

Ottawa, Ont. Can., Oct. 28, 1920
"Using Simpson Mixer to mix core sand in our brass foundry —getting good results."
Ontario Specialties Co.

Chicago, Ill., Sept. 27, 1920.
"We are using four of your No. 2 Simpson Mixers at our Deering Works, for core sand and facing sand. Have effected attractive saving and secured excellent results."
International Harvester Co.,
(Deering Works.)

Chicago, Ill., Jan. 10, 1921.
"Regarding your Simpson Mixer which we have in our foundry we are using this machine with very good results for facing, also for core sand, using both oil and pitch binders. Aside from the saving in binders and new sand, which offsets the cost for power to run the machine, we save about $8.00 a day in labor besides. We have no complaints whatever to make and regret that we did not have the machine years ago."
Semi-Steel Test Foundry Co.

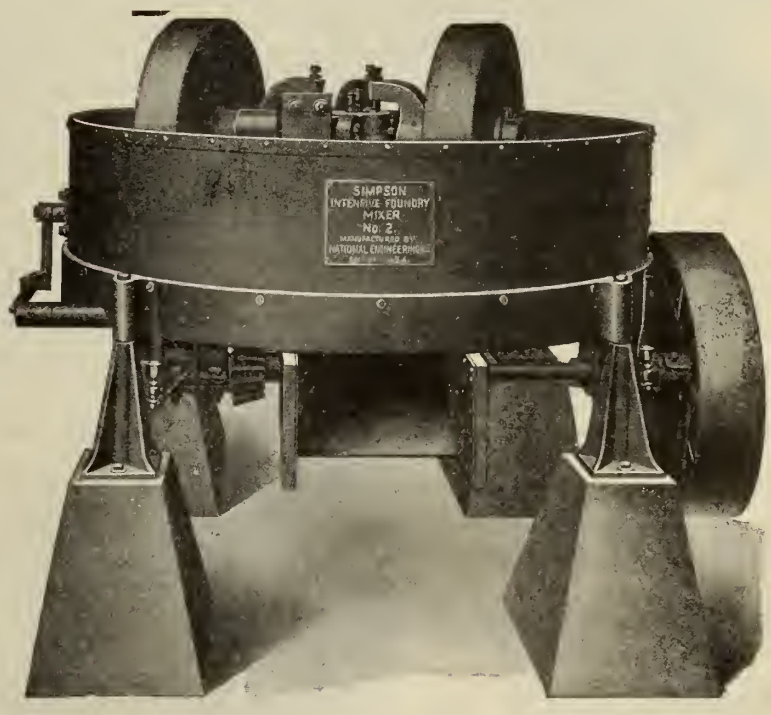
Bay City Mich., Jan. 14, 1921.
We are getting good results with your Simpson Sand Mixer. Its the best Mixer we know of. We use it for converter and ladle linings, steel facing, etc. We used a day and night crew on our old machine, but have time to spare with Simpson Mixer."
Industrial Works.

These Firms Maintain—

What we have always said that the Simpson is **economical and efficient for all kinds of sand mixtures in foundries producing steel, gray iron, malleable, brass and aluminum castings.**

The spirit of the letters shown here is typical of existing conditions in hundreds of foundries throughout Canada and the United States. Without a single exception the adoption of a Simpson Mixer means better mixtures and better castings with minimum labor and upkeep expense.

Send for pamphlet No. 50 and list of many users.



NATIONAL ENGINEERING COMPANY
MACHINERY HALL BUILDING
549 W. WASHINGTON BLVD.
CHICAGO, U. S. A.

PIG IRON

(ALL GRADES)

FERRO MANGANESE—FERRO SILICON

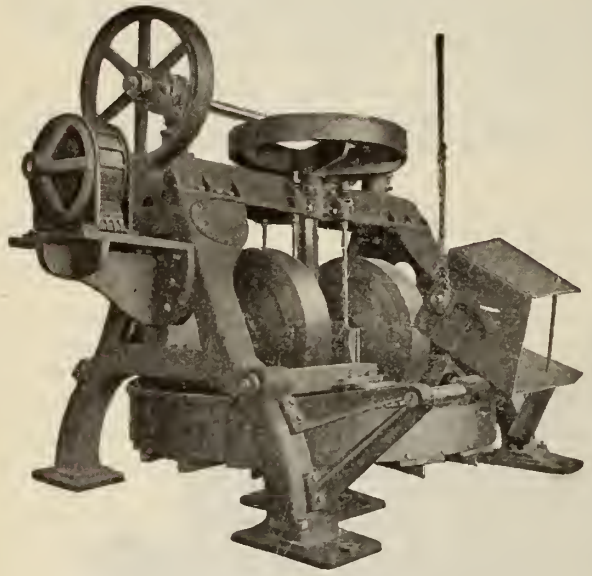
Stock and Import

A. C. LESLIE & CO., Limited, MONTREAL

Frost

Wet Pan Sand Mill

for Steel Foundries

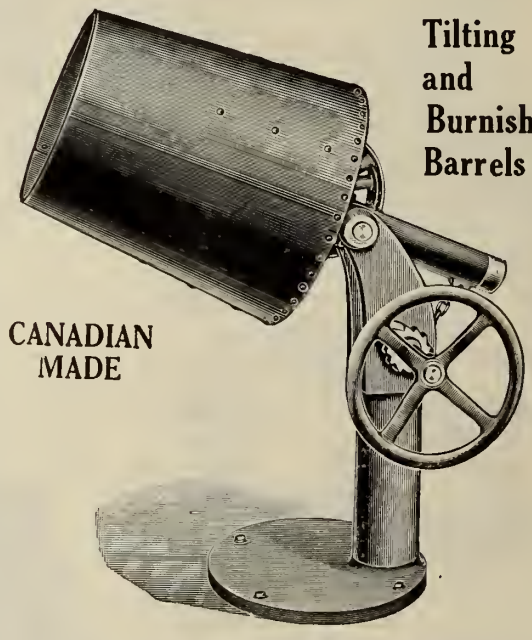


The Frost Mfg. Co.

112 W. Adams St.
CHICAGO

Tumbling Barrels

Tilting and Burnishing Barrels



CANADIAN MADE

N. SLATER CO., LIMITED

ACME STAMPING & TOOL WORKS BRANCH

Hamilton, Ontario

Hawley-Schwartz

BETTER melts, in less time and at lower costs, are the results that go with Hawley - Schwartz Melting Furnaces. They are economy producers in every sense.

The Perfect Melter

THE Hawley - Schwartz heats uniformly and will handle all metal from 50 lbs. to 10,000 lbs.

Write for catalogue and complete information.

The Hawley Down Draft Furnace Co., Easton, Penn., U.S.A.

SLY SAND BLAST EQUIPMENT "UP - TO - DATE"

No. 4 Sandblast Barrel

Tilted Type - - - Five Sizes
SANDBLAST BARRELS

Ideally adapted for cleaning small work and extensively used for forgings, stampings, grey iron, brass, bronze and aluminum castings. Most intricate work can be cleaned successfully, as owing to the tilted position of the barrel, revolving at an incline, in connection with the conical bottom plate, the work is turned at such various angles that all parts and surfaces are exposed to the blast.

These mills can be had in five separate sizes, ranging from 14″ to 36″ in diameter, and from 16″ to 36″ in depth.

The W. W. SLY Mfg. Co.

Main Office and Works:
Cleveland, Ohio

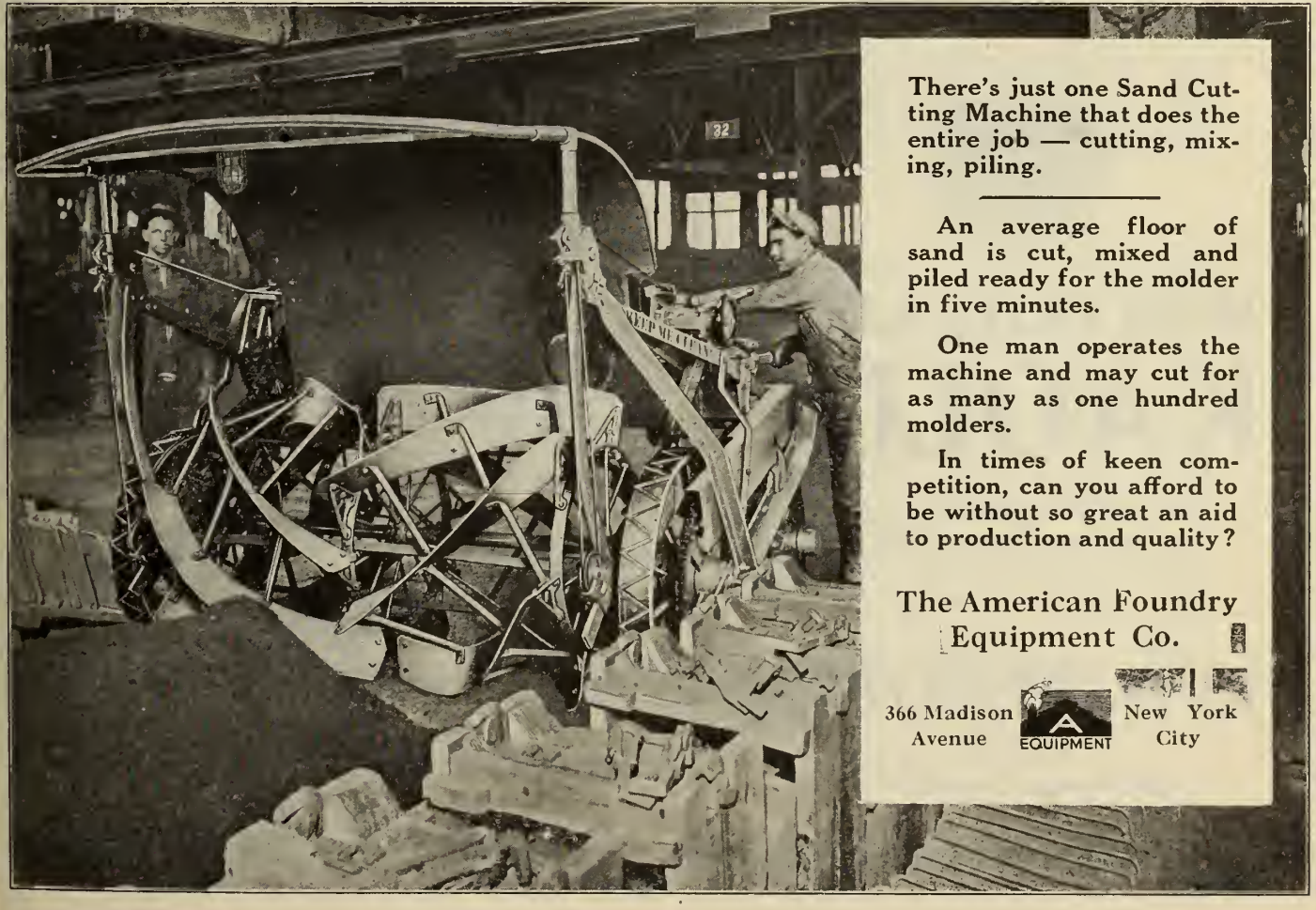
New York
Washington
Birmingham
Paris, France

Chicago
Detroit
St. Louis
Los Angeles

Representatives for Quebec and Maritime Provinces:
Williams & Wilson Limited, Montreal, Que.

The SLY Line of up-to-date Foundry Equipment

Steel Tumbling Mills
Iron Cinder Mills
Brass Cinder Mills
Resin Mills
Sand Blast Mills
Sand Blast Mills—Tilted
Exhaust Fans
Sand Blast Rooms and Blast Cabinet
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers



There's just one Sand Cutting Machine that does the entire job — cutting, mixing, piling.

An average floor of sand is cut, mixed and piled ready for the molder in five minutes.

One man operates the machine and may cut for as many as one hundred molders.

In times of keen competition, can you afford to be without so great an aid to production and quality?

The American Foundry Equipment Co.

366 Madison Avenue — New York City

TABOR
3-inch Plain Jarring Machine For Small Molds And Medium Sized Cores

3" Tabor Jarring Machine with 12" x 14" Table

A Necessity in Every Foundry

SEND FOR BULLETIN M-J-P

THE TABOR MFG. COMPANY
6225 State Road, Tacony, Philadelphia, U.S.A.

WHITEHEAD'S KAOLIN

Most reliable material for lining and patching Cupolas, Furnaces, Ladles, etc., saves time, labor and firebrick.

E. B. FLEURY
AGENT
1609 Queen Street W.
TORONTO, ONTARIO

Use the Master Flask

Stamped with the "Diamond" trade-mark, Master Flasks are a production asset to every molding floor. They are speedy, durable, accurate, light in weight, easy to handle and wonderful economizers of floor space.

DIAMOND

See that the "Diamond" trade-mark is on your next flasks. It means longer service.

Sold in Canada by: Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

DIAMOND CLAMP & FLASK CO.
40 N. 14th Street, RICHMOND, INDIANA, U.S.A.

Reasons! ---and More Reasons!

The Riddle operates exactly like a man sifting sand. Sifts as fast as a man can shovel into it.

The motor is totally enclosed. No dust can get it. It's a ¼ H.P. making power CHEAP.

Requires no overhead equipment. Can therefore be used any place in the foundry.

Equipped With Handles *--Makes Moving Easier*

It's Portable *--Saves Time*

Screw the socket in and the Preston is ready for actions. No fuss, no bother. One cent an hour covers Power Costs.

The

PRESTON *Ball Bearing Electric Sand* RIDDLE

is a "reason why"---a "show you" Riddle.

It **proves** that it is everything a good riddle should be before a cent is asked in payment. This message, then, is directed to the man who must be convinced—and convinced thoroughly.

What do you expect of a riddle? You want one that operates fast and costs little for operation. That's the Preston all over. It will keep one man **busy** all day shovelling into it at a cent an hour power charge.

What else do you demand? You want a riddle that is staunchly constructed, long-lasting, portable and a producer of thoroughly sifted sand. Study the illustration above—it affirms most of these points. **Then back it up by asking any user.**

Still, in spite of these efforts, perhaps you are not yet convinced. Well, here is what we'll do. At absolutely no cost to yourself we will place a Preston Riddle in your Foundry for a fifteen day trial. We will pay all the charges—you send it back if not satisfied.

Write now for details of our trial offer

The Preston Woodworking Machinery Co.

LIMITED

PRESTON, ONTARIO, CANADA

Another Lane-Designed Foundry

Preparedness has come to be a word of extreme significance--in peace as well as in war.

Preliminary plans, with estimates as to cost, in regard to your proposed new foundry or foundry addition, constitute preparedness for business to come. With such plans, all your building problems will have been solved, and you will be in a position to have the detailed plans rushed through when the proper moment arrives.

Let us explain to you how this branch of our service to foundrymen is conducted.

THE H. M. LANE COMPANY

Industrial Engineers and Foundry Specialists

OWEN BUILDING, DETROIT, MICH.

Canadian Office: The H. M. Lane Co., Ltd., LaBelle Block, Windsor, Ont.

Keep Your Eye On Los Angeles Where There Are More McLain Boosters Than Any Other City In The Golden West

"We have had several McLain graduates in charge of our foundry and each has proven that he not only qualified as a metallurgist but also was a business getter and money maker as well.

"As one of these men was employed as molder while working thru your course I know he not only learned to mix and melt iron but your ideas on foundry management, proved to me that you have evolved a new science of economic foundry practice. Enter my order for McLain's System. I need it too."

A Los Angeles Foundry Owner.
(Name on request.)

We Are Builders of Foundrymen

Every foundry manager, superintendent, foreman and ambitious employee should have the 1920 edition of McLAIN'S SYSTEM which contains the World's Best Knowledge on Mixing and Melting Gray Iron and Semi-Steel.

Thru our correspondence feature new ideas flow in from a thousand channels—knotty casting problems are solved and it is obvious that the very nature of our business keeps us constantly charged with constructive and creative methods.

Let us help you make new history in your foundry

McLAIN'S SYSTEM, Inc.

700 Goldsmith Bldg. **Milwaukee, Wis., U.S.A.**

5802.30 lbs.
5137.75 "
664.55 "

664 pounds of iron Saved on 42 castings

Just at the time of shifting over from the use of hand-moulded castings to machine-made castings an Ohio machine manufacturer made an exact analysis and "before-and-after" comparison between the castings for a single model.

42 castings are required in the machine selected for the comparison.

The average weight of the castings (before machining) was **15.8 pounds less** for the machine-moulded product.

The total saving—664 lbs. of metal or **almost eleven and one-half per cent.**—represented a double saving—first in the foundry, second in the machine shop.

Facts such as these are rapidly compelling manufacturers who in the past have accepted hand-moulded castings to insist on machine-moulding—even though a hand-moulding foundry would take the job at close to a no-profit price.

For a thorough discussion of machine moulding, write any office listed here.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
CLEVELAND
New York Chicago Milwaukee San Francisco Detroit

OSBORN
MOULDING MACHINES

CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Member of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

Heating and Ventilating the Smoky Foundry

Keeping The Foundry Supplied With Warm, Pure Air Is Essential To The Well Being Of The Men And The Success Of The Employer

By F. H. BELL

A SUBJECT which I have dwelt upon on several occasions and one which cannot be overdone is that of heating and ventilating the foundry. This may not seem to be a very important subject to the proprietor of the foundry, particularly if he does not work in the foundry himself, but if he, instead of being proprietor, happened to be one of the men in the shop he would undoubtedly take a different view of it.

Ask any molder what is his greatest objection to working in the foundry (and they all have objections and regrets) and he will enumerate a lot of supposed grievances with an equally numerous list of sure-cures or panaceas, which he conscientiously believes to be correct. But after we have weighed the lot we can usually trace them all directly to the one cause, viz, the improper heating and ventilating facilities in the shop where he is employed.

Perhaps the average foundry workman does not realize that this is the foundation of most of his troubles, but if he will go to the trouble of looking into the matter he should be easily convinced. For instance, if he will but consider it, if the work he is doing was done outside of the shop he would feel a lot different after his day's work. No one knows any better than myself what a molder feels like at the end of the day. I know that he is exhausted and feels that he made the mistake of his life when he had so many seemingly better opportunities but selected foundry work as a life's occupation.

It is all very well to make labor saving devices and point out that the molder is not so badly off as he used to be but unless we can give him pure warm air to breathe we can not expect him to enjoy good health.

When I say warm air I may appear humorous to the average man who never worked in a foundry. To most people the only objectionable feature in the foundry is the heat. They seem to picture the molder living on melted iron from morn till night and argue that the summer months must be terrible. They can hardly believe that the winter time is the time when the molder suffers the most. In the summer time it is possible to open the doors and windows and get some ventilation but in the winter time this is not possible and those on the inside suffer accordingly.

Of course the ventilation in the summer time is not satisfactory but it is not by any means the foundry's worst feature. In the winter time the shop is of necessity closed up tight in order to keep it as warm as possible, thereby shutting out the only chance to rid the place of smoke and gas.

Now to get back to the expression "Warm." It must be remembered that there is very little heat around a foundry until the last hour or possibly couple of hours in the day. When the ventilators on the roof are opened the heat seems to be the only thing which escapes and in order that the night gang or those who do the shaking out in the day time do not strangle from breathing gas and smoke the windows and doors are usually opened along with the ventilators. With castings of medium

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weight they will be cold when morning comes but if the casting is heavy enough to keep hot over night a man will invariably open a window beside the job so that he can have fresh air, regardless of the fact that the smoke is being blown around the shop to annoy everyone but himself, and in addition to this the wind which is coming through the window, while keeping the laborer cooled off is making it too cold for those who are not digging out hot castings.

In the summer time there are days when the heat is beyond endurance and it is necessary to keep the shop cooled by artificial means, but we will refer to this later, and we will for the present consider both heating and ventilating the foundry in the winter.

What is wanted is a system which will carry away the foul gas and smoke without opening the windows, and at the same time deliver fresh air sufficiently warmed to keep the workmen comfortable. So far we have only considered the men who work on the floor, but we must not forget that there are others such as the men on the charging floor and the crane men. Most modern foundries are equipped with electric travelling cranes, and of course the operator has to stay up in the cab and he certainly gets the benefit of what is coming his way. To emphasize this point I will submit a small article prepared by Mr. A. S. Capwell, which also covers some of the ground which I have already covered. Mr. Capwell favors the fan system of heating and ventilating foundries and of course considers it the best. Whether he is right or wrong is not for me to say. Like everything else, circumstances alter cases and what is most suited in one case might not be in another. The purchaser must be the judge. Here is Mr. Capwell's view on the subject:

Have you ever stopped to consider what a fine thing it must be to sit in the crane cab in a poorly ventilated foundry? It is bad enough to be down on the floor toting the heavy ladles, but to be up among the smoke, gas and dust! Deliver us.

I wonder what the crane man would answer if he were asked "Does a Foundry need ventilation?"

No one who has ever been in a foundry particularly when pouring or shaking out molds, needs any lengthy discourse on the need for Foundry Ventilation. Not only for physiological reasons, such as personal welfare and health, but the cold facts of dollars and cents in increased production make ventilation an essential to the modern foundry.

Not so many years back all that was considered necessary was to keep windows and skylight open, and trust to luck that the noxious gases would escape. The resulting murky interior was tolerated as a necessary evil and the word foundry was long synonomous with dirt and gloom. With the progress made in the heating and ventilating art, most of the so called necessary evils, connected with various industries have been found baseless bugaboos and with a properly designed heating and ventilating system, the modern foundry is just as clean as any part of an up-to-date manufacturing plant.

The Fan System of Heating and Ventilating has been found the best suited for foundry application. This system consists of a mechanically driven fan of the centrifugal type, a suitable heater made up of cast iron or wrought iron pipe sections and an air washer. Air is taken from outside by the fan and passed through the air washer. This subjects the air to a minutely divided spray of water which effectively removes practically all of the dirt and dust and also imparts the proper amount of moisture or humidity. This clean air is then passed over the heater sections which are served by steam and on leaving the heaters is distributed throughout the plant through a suitable system of sheet iron duct work.

A typical noon-hour scene in the regular run of foundries. Note the heating and ventilating system in the center of the group. Motto:—"Anything is good enough in the foundry, so long as the fellows will stand for it."

This system is particularly adapted for heating and ventilating work for the air required for ventilation is made the medium for introducing the heat needed to make the plant interior liveable. Thus one apparatus serves both needs. Another fact not generally understood is that washing air will cool it so that during extreme warm weather a cooling of 15° can be effected. This is a strong point in favor of a fan heating and ventilating system.

Cooling in the summer is effected without additional expense and without changing the adjstment of the aparatus used for winter service. This cooling is done by the evaporation of some of the water in the air washer. Just blow your breath across the tips of your fingers It feels quite warm. Now moisten the tips and blow across again. You certainly can notice the difference. This coolness is due entirely to the evaporation of the moisture. It takes an enormous quantity of heat to evaporate one pound of water, more than the average person has any conception of. To evaporate one pound of water at 70° F. requires 1052 B. T. U. which equals 818,456 foot lbs. This amount of work is the equivalent of lifting a man weighing 150 lbs. to the top of a mountain one mile high.

Air will always tend to absorb water vapor. During the summer months no heat is added to the water in the washer and the only source of heat to evaporate the water absorbed by the air is the air itself and each grain of moisture absorbed per cu. ft. will reduce the temperature of the air 8.5°. It is not uncommon to cool the incoming air 15° which is an appreciable amount in the Summer.

Many foundries throughout the world are reaping the benefits of this system of heating and ventilating.

The Ford Foundry at River Rouge, Detroit, Michigan is one of the largest foundries in the world and the only one where the molten metal is run directly from the blast furnaces into the molds. The ventilating equipment for this plant comprises twelve units, consisting of Motor driven Fans, twelve Carrier Air Washers, twelve sets of heaters and twelve 4 inch Steam Pumps. These units are set on the roof of the building and handle a total of almost one million cubic feet of washed and humidified air per minute. This foundry represents the last word in foundry construction and it is with a sense of pride that the com-

pany who supplied the installations point to the choosing of this type of heating and ventilating apparatus as the one most suited for a plant of this description.

The points of superiority said to be in favor of the fan system of heating and ventilating are:

1. Perfect ventilation regardless of exterior conditions.
2. Uniform and proper distribution of heat.
3. High efficiency of heating surface (3 to 5 times that of direct radiation.)
4. Greatest economy in operation.
5. Utilization of exhaust steam.
6. Positive prevention of cold drafts.
7. Independent regulation of heating and ventilating effect.
8. Great flexibility of operation to suit varying conditions, affording a maximum economy.
9. Ease of control, which prevents overheating.
10. Great compactness, affording an economy of space and reducing the cost of steam connections
11. Perfect drainage, making less repairs necessary and giving a lower rate of depreciation than with direct radiation.
12. Low cost of installation.

Fan Blast System of Heating and Ventilating

The Method Described Is That of Heating the Air and Blowing it Through Pipes With Attachments Similar to Syphons Which Assist in Mixing the Hot and Cold Air

IN the following an improved heating and ventilating system is described in which air is used as the heating medium; it possesses special features by which it differs from the ordinary fan blast system and by which the disadvantages of the latter are practically eliminated. It may be said that the new fan blast system is not only superior to the present systems of its own kind, but that it may also replace steam and water heating systems in buildings where the fan blast system has hitherto been impracticable or too expensive.

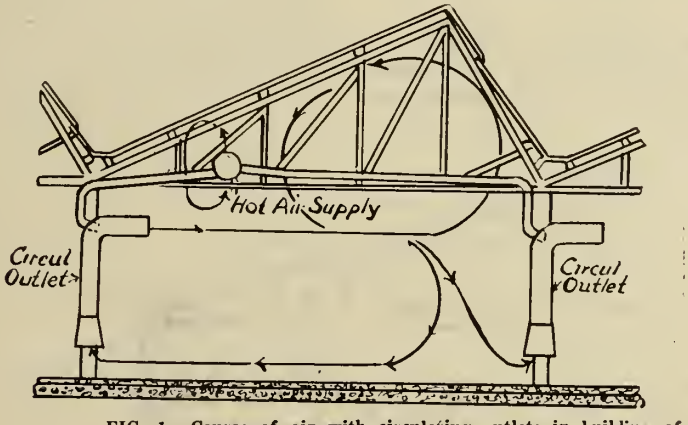


FIG. 1.—Course of air with circulating outlets in building of sawtooth construction.

The salient feature of the new fan blast system lies in the outlets which transmit the air to the interior, two typical forms of which are shown in Figs. 1, 2 and 3. In these outlets the hot air draws, by an injector action, air from the interior into a short duct, the ends of which are placed at different levels. The hot air mixes itself with the air drawn from the interior and the mixing is done just prior to the discharge of the mixture into the interior. The air withdrawn from the interior passes, therefore, only through a short duct and need not pass through the conditioning apparatus, the blower fan and the main duct system, as is usually necessary in fan blast heating systems of the present type. On account of the circulating effect of these special outlets between their two ends which they exert upon the air of the interior, they may properly be termed "circulating outlets."

Advantages of New Method

From this mixing of hot air with air taken from the interior just prior to the discharge into the interior and from the resulting circulation of air in the interior there results a number of advantages which cannot be obtained either by the present air heating systems or, in fact, by any other of the existing heating systems except at extraordinary expense.

With such outlet it is possible:

1. To heat the air coming from the heating apparatus to much higher temperatures than hitherto considered advisable.
2. To reduce the size of the blower fan, heating ducts and air washer (where used) to one half or even less of those of the present systems.
3. To employ air heating systems in buildings, such as office buildings, loft buildings, etc., where hitherto their application has been either not practicable or too expensive.
4. To discharge into the interior large quantities of air the temperature of which can be much lower than that of the air discharged by present systems.
5. To reduce in many cases the first costs and the costs for horse power as compared to those of a system of the present type.

From the fact that the air drawn from the interior into the outlets is taken from the lower part of the zone of occupancy the following advantages result:

7. Heating and renewal of the layers of air close to the floor without overheating the upper layers and without draft to the occupants.
8. The large amount of heat usually necessary for the roof and walls does not pass through the zone of occupancy.
9. Reduction of heat losses through the roof and walls.
10. Draftless circulation of the hot or fresh air through the zone of occupancy and in absolutely positive manner.
11. Existing heating and ventilating systems, where inconveniences from drafts, overheating of the upper zones and insufficient heating of the lower zones or poor ventilation of the zone of occupancy are obtaining, can be improved by changing the ordinary outlets to circulating outlets, as shown in Figs. 1, 2 and 3.
12. Existing fan blast systems can be increased in their heating capacity by changing the ordinary outlets to circulating outlets.
13. In cooling and ventilating systems, such as are used for theatres, audience halls, school houses, etc., the circulating outlets greatly improve the uniform and draftless distribution of the cool fresh air.

Uniform Temperature in Interior Near Floor and Roof

If we consider a building in which a large part of the heat is lost through the roof and where, therefore, a large quantity of heat must be transferred to the roof surface, we find that this can be accomplished in different ways. The zone near the floor could be heated directly and uniformly either by heating the floor underground or by providing numerous small radiator units throughout the interior in the lower part of the zone of occupancy. In the first case, the initial costs are prohibitive; in the second case it is impracticable to place many small radiator units all over the floor. The usual practice is to provide large units of radiators near walls and columns which are creating individual upward currents of hot air and downward currents of cool air, causing large heat losses through the roof and hot zones and cold drafts in the zone of occupancy. In both cases the total quantity of heat needed for the roof which, in the ordinary one-story building, is usually about three times as much as that needed for the floor and zone of occupancy, passes through the latter and is

liable to create locally considerable overheating of that zone.

Another manner of heating the roof is by providing radiators for the roof independently from those needed for the zone of occupancy. This way is wasteful in first cost and usually causes overheating under the roof and consequently large heat losses.

A fourth way finally of heating the roof would be to distribute a large quantity of moderately heated air in the interior, spread out horizontally and evenly as possible. If the air would be distributed above the zone of occupancy and if part of that air could be made to traverse the zone of occupancy and the zone near the floor, then the most economical and the most agreeable system of heating the roof and interior would have been found.

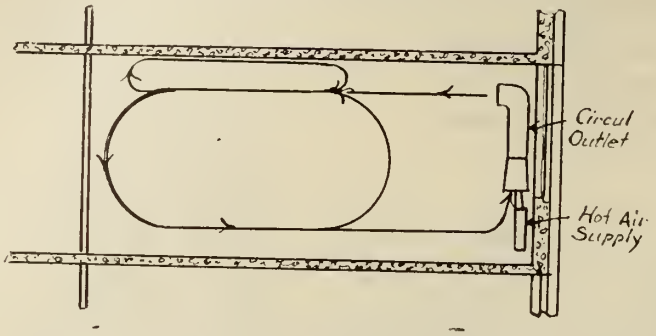


FIG. 2.—Course of air in ordinary room with circulating outlets.

This is exactly what the new system does. The hot air, coming from the heating apparatus, is mixed with a quantity of moderately warm air from the interior, the resulting mixture, the temperature of which is less than 100 deg. F., even in extreme weather, is discharged horizontally, by means of diffusers, so as to cover the entire floor area. The large quantity of air discharged through the outlets, mixes rapidly with air of the interior, thus further reducing its own temperature. The resulting numerous currents of warm air rise slowly to the roof, intercept the currents of cooled air flowing downward, strike the roof at slow velocity and at low temperature, reduce the temperature losses through the roof to a minimum and create in the upper zone of the interior uniform conditions of temperature and air distribution. At the same time, part of the air mixture discharged through the outlets is drawn into the lower openings of the latter and thus forced to pass through and heat the zone of occupancy and particularly the zone near the floor.

System Provides Frequent Air Change in Zone of Occupancy

It is evident that through the action of the circulating outlets there must result an almost uniform temperature throughout the interior of the room thus heated. The quantity of the air withdrawn from the interior can easily be made so that a change of air takes place in the zone of occupancy every five to ten minutes. If the lower inlet openings are placed near the floor, about 2 feet from the floor level, the suction from the outlets will draw in at first the layer of air within this zone. Ordinarily, when the system is started this air will be several degrees lower in temperature than the upper layers of air and the outlets will remove at first this cold air near the floor before they will draw on the warmer and lighter air of the upper levels. When the cold air near the floor has been removed, the air from the upper levels will be forced down and a continuous circulation of warm air from the upper to the lower levels of the interior will take place. As the air which is forced down from the upper levels has no possibility of losing any of its heat, it is evident that within a short time after the system has been started the temperatures at the upper and lower levels must be practically uniform.

Theory Borne out in Practice

Actual measurements of temperature in a foundry, in which circulating outlets of the type illustrated in Fig. 1 were installed, have shown the correctness of the above contention. The building covers an acre of 170 x 250 feet., is covered by a saw-tooth roof, the roof being constructed of 2-in. wood planking with a ¼-in. felt insulation and a five-play felt and tar covering. The skylights are of steel and double-glazed, the floor has a 9-in. concrete base. The lowest and highest parts of the roof were 12 feet and 23 feet respectively, above the floor level. The air was introduced 9 ft. and withdrawn 2 feet above the floor; the temperature of the heated air was 130 deg. F., that of the air discharged 98 deg. F., and the quantity of the air withdrawn through the outlets was about equal to that of the hot air supplied. When the lower intakes of the outlets were open, the temperature differences at points 3 ft. and 14 ft. above the floor were from 1 deg. to 3 deg. F., with the lower openings closed the differences were from 5 deg. to 8 deg. F.

Larger Quantities of Air Discharged at Lower Temperatures

The heat losses through the roof will be the less the smaller the difference is between the temperature immediately beneath the roof and the outside temperature. The minimum of heat losses will be obtained if the temperature of the air near the roof on the inside is equal to that in the zone of occupancy. It is clear that a further drop of the temperature in the upper levels is not desirable as this would cause down drafts of cool air into the zone of occupancy. The upper layers of air should be even somewhat warmer than the lower ones.

It is interesting to investigate how small a rise of temperature in the heated air is sufficient to make up the loss of heat through a roof and what air quantities are needed. If we take for instance, a 2-in. plank roof with a five-ply tar and felt covering, we find that the heat loss would be 0.25 B. T. U. per square foot of roof per degree difference in temperature per hour. At an inside temperature under the roof of 68 deg. F., and an outside temperature of zero the heat loss per hour would be 17.00 B. T. U. If we now assume a drop in temperature of only 3 deg. F. in the air of the interior through the cooling effect of the roof, then we would need 312 cu. ft. of air per hour at 68 deg. F. to heat 1 sq. ft. of roof surface. If we take the heat loss

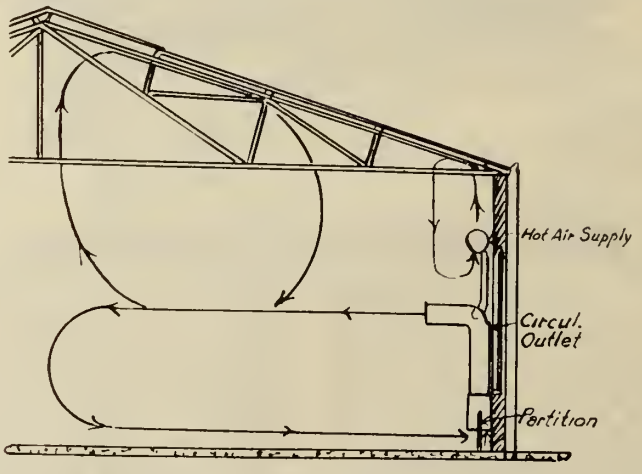


FIG. 3.—Course of air in large interiors with circulating outlets.

through the floor as one third of that through the roof and if we further assume that one outlet covers a floor area of 1,000 sq. ft., then we find that 6933 cu. ft. of air at 68 deg. F., would be needed per minute to heat the floor and the roof. The temperature under the roof could then not be higher than 68 deg. F., and the loss of heat through the roof and floor would bring the tem perature of the air to 65 deg. F.

In practice it has been impossible hitherto to supply such large quantities of air because it would make the heating

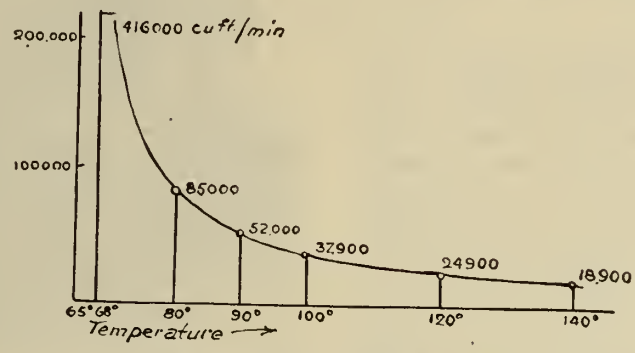


FIG. 4.—Decrease in quantity of heated air required with rise in temperature in a given case.

apparatus and the duct system much too large and expensive. Assuming in the above instance an outlet velocity of 1,000 ft. per minute, one outlet alone would require a 36-in. pipe and a building of 300 x 200 sq. ft. of floor space would need 418,000 cu. ft. of air per minute for roof and floor alone. In actual present practice the air would be delivered to the building probably at a temperature of 140 deg. F. and the quantity of heated air required would be 18,900 cu. ft. per minute.

Fig. 4 shows the quantity of heated air in the above example decreases as the temperature rises. We find that, while the quantity of air needed at a temperature of 140 deg. F. is 18,900 cu. ft. per minute, it is twice as much at a temperature of 100 deg. F. then it rises rapidly so that at a temperature of 80 deg. F. the air quantity is already about five times, at 68 deg. F. about 25 times that for a temperature of 140 deg. F.

It is, however, not necessary to make the difference between the inside temperature and the temperature of the discharged air as small as 3 deg. F. because the heated air will to a certain extent, depending upon the form of the outlets and the discharge velocity of the hot air, mix with the air of the interior, and, therefore, have its temperature reduced. However, it is plain that the lower the temperature of the discharged air, the closer the ideal conditions, outlined above, will be approached.

With the circulating outlets we can get pretty near to those ideal conditions. If we, for instance, assume that the air be heated to 140 deg. F. and that we draw from the interior about three times the quantity of the heated air, a ratio which can, by proper design of the outlets, be obtained without difficulty, then we deliver the mixed air into the interior at a temperature of 81.8 deg. F. The quantity of mixed air for each outlet in the above example would then be 1270 cu. ft. per minute, that for the entire building 76,200 cu. ft. per minute; the diameter of the individual outlets would be 16 in. Considering that this quantity of air mixes itself again with the air in the room, we can reduce by means of the circulating outlets the temperature under the roof practically to the minimum desirable.

Circulating Outlets Requirements

Of course, the circulating outlets will require additional first costs and additional horse power in the blower, but it will be shown later that these are by no means prohibitive and will make the sustem cheaper if we consider the saving of heat and the additioal advantages resulting from the draftless circulating of the air through the zone of occupancy and the uniform heating of the interior.

From the above it is evident that the use of the circulating outlets effects in itself a saving of heat. Furthermore the circulation of air from the upper to the lower levels acts as an almost instantaneous indicator as to the proper quantity of heat necessary for the building under the varying conditions of outside temperature and other influences. If either too much or too little heat is supplied the temperature in the zone of occupancy rises or falls quickly and the supply of heat can be regulated accordingly. This is especially easy in an air heating system where the shutting off or adding to the supply of steam in the heating apparatus makes itself quickly felt in the temperature of the hot air delivered.

As the quantity of air drawn from the interior can be made several times the quantity of the hot air supplied, it follows that a very effective circulation of air can be created in the zone that lies between the intake and the discharge openings of the outlets. This circulation is absolutely positive; if the mixture of air is introduced above the zone of occupancy the greater part, in practice one-half or more of that air, has been withdrawn from the zone of occupancy. For this reason a rapid change of air must take place in that zone. Depending upon the number and location of the outlets the circulation of air can be made more effective than in any other ventilating or heating system on account of the large quantities of air moved. For instance, in the saw-tooth building mentioned above, (see Figs. 1 and 4), in which ordinary outlets discharging directly into the zone of occupancy, were replaced by circulating outlets the circulation of air in the interior as originally calculated to take place once in every 17 minutes. When the circulating outlets were put in place they withdrew from the zone between the upper and lower openings about the same quantity of air from the interior as that of the hot air supplied and effected a circulation of air in the zone of occupancy once in every 6 minutes.

Obviating Drafts in Zone of Occupancy

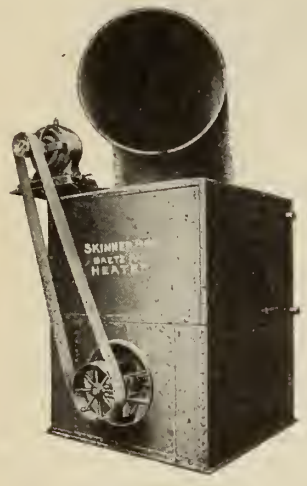
A special feature of the circulating outlets is that their discharging and their recirculating action takes place without causing drafts in the zone of occupancy. In hot air heating and ventilating systems hitherto installed, the common method of discharge into the interior is either to blow the air from outlets which are placed high above the zone of occupancy, downward into the latter with velocities up to 1,400 ft. per minute, or else to carry the discharge pipes to within three feet of the floor and to discharge the hot air at low velocities. With ordinary outlets there is no other way of bringing the heated or fresh air into the zone of occupancy. In both cases hot and cold drafts in the zone of occupancy are unavoidable, no matter how the outlets are arranged or what the velocities are. Moreover the full quantity of heat needed for the building is carried into the zone of occupancy creating there areas that are overheated.

With the circulating outlets these disadvantages of air heating and ventilating systems are avoided. The air is discharged horizontally above the heads of the occupant, and a large quantity of warm air is forced from the upper levels into the zone of occupancy through the circulating action of the outlets at an imperceptable velocity and in absolutely positive manner. Thus large quantities of warm or fresh air are moved through that zone without causing the least discomfort to the occupants. In the saw-tooth building mentioned above (see Figs. 1 and 4), the discharge openings were 9 ft. above the floor, the air was discharged horizontally or even slightly upwards; there was not the slightest feeling of draft in the entire room and every square foot of floor space could be occupied by the workmen without paying any attention to the warm air inlets.

Mechanical Features of The Baetz Heater

A Convenient, Self Contained, Portable Heater—Ideal for Heating the Foundry With Clear, Pure Air

THE ILLUSTRATIONS here shown are of the Baetz heater. This embodies many of the features of the one just described, but instead of being installed in a department by itself and supplying the warm air through pipes to the plant it is a self contained unit and can be placed where ever desired. Any number can be placed in a shop according to the size of the shop. The heater consists of a series of steam pipes



The Baetz Heater.

compactly mounted as a coil above a powerful fan-wheel and all housed as a single unit within a heavy structural and sheet steel casing.

The coils are heated with exhaust or live steam, and the air near the floor level is drawn into the heater by the fan, forced up through and around the steam coils, and after being heated is gently diffused through outlet hoods into the open building space. No outside ducts or pipes are used for air distribution, and as the air is discharged at low pressure it does not disturb floor dust or create drafts.

Where steam is not available for heating the coils these heaters can be equipped with fire-place to burn any kind of fuel.

The illustration shows the blower being driven by electric motor, belt connected but it can be operated by any power available—motor (either belted or direct) engine or line shafting. The motor driven ones are frequently seen in electric trolley cars and receive their power from the same source as the motor which drives the car. A very small one answers this purpose and heats the car to perfection, evidently competing with the electric heater which is quite convenient to install where the power is right at hand. The foundry scene shows how they are arranged to supply warmth and ventilation to the foundry. It might be explained that they are portable and can be placed where they will be out of the way. It heats the foundry for a large radius around it, regardless of building construction, location or weather conditions. It is particularly adapted to foundries since the lower stratum of air is kept equally as warm as the upper. The sand can not freeze where one of these heaters is installed and is therefore always ready for immediate use. It permits prompt and ample ventilation during the time of pouring off. It keeps the air clear and quickly heats the building after the monitor windows are again closeted, and as we have already mentioned it does not disturt the dust from the floor.

The Mechanical Hot-Blast Foundry Heater

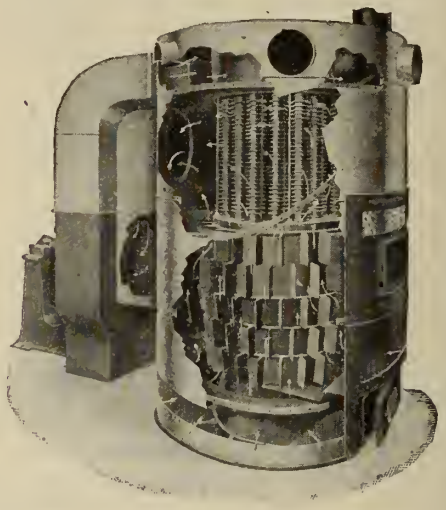
A Method by Which a Blower is Attached to a Hot Air Furnace. The Whole Being Self-Contained and Portable.

ANOTHER system which has many points in its favour is the mechanical hot-blast system which both heats and ventilates the foundry at the same time.

Realizing the advantages of all types of heating and ventilating systems offered the public cannot be embodied in one unit, and that no one type is best suited to every and all conditions, the designers of this type of heater have endeavored to offer a direct fired unit type heater that includes many advantages of other types and at the same time eliminating many of their disadvantages. They have spared no pains in making it worthy of the efforts put forth in its development.

It consists of a hot air furnace with a fan attachment which forces the heated air out of the hot air chamber and in doing so draws other air in to be heated.

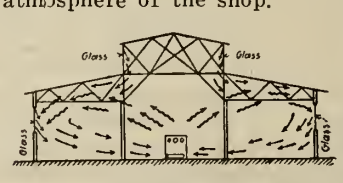
For the purpose of reducing the amount of fuel used in heating the upper section of the foundry where it does not require to be heated and to draw the heated air to the floor where it is needed, the designers have embodied the principle of air-propulsion in a hot air furnace. A mechanically driven multi-vane fan projects the heated air horizontally from the top of the furnace at a rate of from 5,000 to 15,000 cubic feet per minute, depending on the rated capacity of the installation. Because of its speed, the air rises only sufficiently to form a slight arc terminating at the sides of the building. Here its direction is determined by the suction of the furnace fan which draws in the air on the floor level. Although the natural tendency of warm air is to rise, in this case the cold air does not have time to descend and its weight causes a good back-



Mechanical Hot Blast Heater—Note Staggered Fins and Tubes.

ing to prevent the heated air from floating away, and the vacuum created below forces the warm air in a downward sweep back to the heater. Or in other words the air coming in horizontally at the floor level and passing out horizontally and at considerable speed eight or nine feet above the floor level there is not much else it can do but keep up a continuous circuit as is indicated in the line sketch herewith shown. This scheme of circulation is said to have the effect of holding approximately 75 per cent. of the heat units generated by the furnace within the breathing zone. In foundries a further advantage of the installation is the fact that the down current of comparatively dry warm air absorbs the steam rising from the moulds on the floor.

At the furnace the cycle of circulation just described is completed, the air on the floor being sucked in through an annular opening practically surrounding the base of the furnace and an aperture below the coal door, after which it is again forced out by the fan through the open leader pipes of the bonnet into the atmosphere of the shop.



Cross Section of Monitor Type Foundry.—Note Course of Arrows.

In the sketch will be seen a cross-section of a foundry of monitor type construction. The arrows show the course of the current of air. It will be seen

that the men are not breathing the same air over and over again, but there is a considerable space in the center of the shop over head where there is very little circulation and very little heat absorbed.

The Furnace

The cost of the installation is not great and the operating costs are said to be low, because every heat unit generated from the fuel by correct design is transmitted to all of the air handled over every square inch of heating radiating surface. By staggering the fins and tubes, together with the proper location and design of baffle plates, the air is broken up during its passage through the various heat chambers thus permitting it to collect a greater number of heat units than is possible were the air passing over a smooth radiating surface.

Keeping Piston Cool By Means of Air Pocket

A Dead-Air Pocket In The End of Piston Keeps The Piston Cool

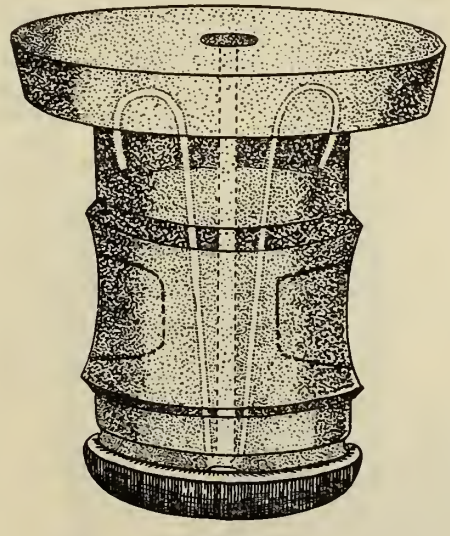
As has been pointed out in Canadian Foundryman on so many occassions the two callings, foundry work and engineering are so vastly different that a reference to one is unintelligible to the man who follows the other.

This may not be accepted by the engineering fraternity who know all there is to know about the foundry in their own estimation, since there is not much of any thing to know according to the mechanical genius from the engineering department to keep our foundry equipment in working order, and in return we treat him civil while he is giving us pointers on how we could do foundry work in a better manner than it is commonly done if we just had his intellect.

But to get right down to business, there are times when it is handy to have a little knowledge outside of our own sphere. In the illustration here shown will be seen the core for the inside of a piston such as is used on the gasoline engine of an automobile. In order that the foundryman will understand the part he is to perform it is as well for him to understand some of the points in engineering.

In steam engineering it was always a problem to keep the cylinder and the piston warm to prevent the steam from condensing and for this reason they were usually lagged with asbestos. With gasoline engine practice everthing is reversed. The tendency of the cylinder and piston is to heat, and unless some means is provided to keep them cool they will soon become so hot as to stall the engine and, in fact, ruin it. To keep the cylinder cool has not been found a very difficult proposition. A steady stream of water flowing around the cylinder and kept in place by means of a jacket cast onto the cylinder for the purpose is the usual means adopted. This together with various types of blowing apparatus covers the field satisfactorily. But like surgery an external operation is simple compared with operating on the internal organs So likewise is it a different matter to keep the piston cool than it is to cool the cylinder.

Unlike the steam engine which has a piston rod to guide, the piston of a gasoline engine requires to be long enough to guide itself. The two bosses which project into the core are for the connecting rod to pivot on, while the heavy section at the lower part of the illustration is to be grooved for the piston rings. Beyond this is a flat end which receives the force of the gas explosion which takes place a good many times for every mile travelled by the car. To prevent this from heating is the object of the device shown. The molder will know that the flange at the top of the core is simply a core print and does not form any part of the casting. At the bottom end will be seen a sheet iron chamber which is cast into the metal which forms the piston. This chamber, as will be seen, is slightly



Core for interior of automobile piston. Note the steel air chamber at bottom, which acts as an insulator.

bigger in diameter than the core so that it will be securely cast into the metal. This sheet metal affair forms an air tight chamber in the end of the piston which while perhaps not as good as a vacuum, acts in a somewhat similar manner, dead air being considered as almost as good an insulation. When the explosion takes place, this dead air will not absorb the heat and consequently the piston does not heat. The sheet metal from which this chamber is made should be as clean as possible to avoid gas when the melted iron comes in contact with it, but no matter what precaution is taken there will be some gas formed and to take care of it a vent hole must connect it with the top of the core print. In the illustration will be seen the vent hole and the wires which hold the steel tight against the core. Considerable experimenting was done before arriving at a satisfactory method of getting sound castings, and the method shown was found to give the best satisfaction. A hole was punched in the steel and wires secured. This steel is placed in the core box with the wire attached and projecting up to the rod is also stood in place between the wires. A ring of paste on the steel plate would also be advisable as an increased insurance against metal getting into the vent hole. The core is rammed up the same as any core is done, the wires being pulled up good and tight when being tucked in. The rod is, of course pulled out leaving the vent hole. The piston pattern is, of course, a straight round block with the flange on top to form core print. The core fills the print entirely and leaves the casting a plain straight sleeve with legs on the inside and this steel pocket cast in the lower end. When the casting is cleaned this steel chamber will have the hole in it where the vent came out and where the wires were fastened. A drop of solder is all that is required to stop this hole, as the piston will never become hot enough to melt the solder.

This arrangement may be covered by patents although I am not prepared to say what there is to patent. The same thing has been used for casting lugs and hinges on stove plate for many years, the difference being that in the case of stove plate the melted metal is poured into the sheet metal instead of around it. But of course if a man worries his brain perfecting a device he is entitled to his reward. This same idea can be used to advantage in many places beside automobile pistons.

CARELESSNESS

"I am not much of a mathematician," says Carelessness, "but I can add to your troubles, I can subtract from your earnings, I can multiply your aches and pains, I can take interest from your work and discount your chances for safety. Besides this, I can divide your thoughts between business and pleasure and be a potent factor in your failures. Even if I am with you only a small fraction of the time, I can lessen your chances for success. I am a figure to be reckoned with. Cancel me from your habits and it will add to your total happiness."—Paron.

PATTERNS AND CASTINGS

By W. P. ESSEX

The Importance of Sunlight

AIR we must have to live and breathe. Food we must have to live and grow. To grow we must have health, and to have health, there must be freedom from disease. And since most diseases are of a germinal origin, and sunshine is one of nature's most powerful germicides, it reasons out, that to live and enjoy a healthy life we must have sunshine.

The first divine injunction as recorded in the ancient scriptures is "Let there be light," and the light to which this command refers is the clear, penetrating, all-embracing illumination, that has brightened and warmed this cold old world since time began, and millions of years hence, but long before the contraction which is continually diminishing the size of the sun has reduced its mass of incondesence to a dull grey cinder, this world will have become a dark and frozen waste, devoid of light and life. This outlook for the future of the world is not a pleasing one, or the prospect a pleasant one but why worry? If this scientific conjecture is correct, ten million years must pass to prove it.

Fig. 1.—The sun—the source of all light.

The Source of all Light

The source of all light is the sun, and upon its light and heat all life upon this earth is dependent, for nothing really can be said to live or grow, but through its agency. For untold ages the earth has been storing up sunshine in the substances from which to-day we reproduce it in many forms of illumination, which for want of a more accurate term, has been called artificial light.

With the beginning of life upon this planet the process started. Countless ages ago the vast forests and other forms of vegetation. which in time covered the earth and grew in luxuriance nourished by the heat and light of the sun, died and fell, to be buried by the succeeding vegetation which fell and in time became imbedded in the earth's crust, which each succeeding growth deepened, and in further time, by the carbonizing process of nature and the tremendous overlaying weight the decomposed layers were compressed and solidified into coal. And by a somewhat similar action on the decomposed vegetable matter petroleum may have its origin. From these substances which writers have sometimes referred to as "Preserved Sunshine," we in turn obtain most of our artificial illumination in the various forms of oil, gas and electric lights. The latter also when generated by water power can be traced to the sun's influence, its heat raising the water from the natural reservoirs upon the earth's surface by the process of evaporation, which condensing is returned again to the earth in the snow and rain, to replenish the streams. Their waters diverted to the flume flowing into the penstock, compels the turbines to revolve, furnishing the operating energy that generates the electrical currents which meeting at the lamp's filament are transformed into light. And to-day not only directly from the vast stores of condensed sunshine which a generous nature has put by for us, there is light and sunlight in abundance to efficiently illuminate, in the light and dark hours of the day, even the most remote corners of the workshop, if in the design and construction of our buildings scientific methods are adopted to obtain the most effective orientation and mechanical illumination.

Fig. 2.—Storing up sunshine. The vegetation of countless ages ago which in the process of time became coal.

Fig. 3. — Patching a vat at the bottom of a a deep draw.

Good Lighting an Aid to Production

It is only within the past few years that illumination has become a specialized branch of industrial engineering and that foundry and factory executives in general have been forced to recognize the fact. that the installation of properly designed lighting arrangements throughout the factory, is an important factor in production.

Tests made some two years ago by the lighting committee of the Commonwealth Edison Company, in Chicago, to determine what relation lighting had to production, found that under improved lighting conditions the output increased ten to twenty per cent.

A Poorly Lighted Shop is Dangerous

A badly lighted shop is not only a restriction upon the worker, hampering his movements, and preventing him from doing his most effective

work, but it is also a menace to the health and life of the workman. Some time ago the statement was made by a well known insurance company, that more people are killed by tripping or falling in poorly lighted areas, than are killed by automobiles in the United States. It is also stated, that in an analysis made of 91,000 industrial accidents 24 per cent were due wholly or in part to inadequate lighting.

Recent years have brought about

Fig. 1.—A few barrels of whitewash sprayed on the dark walls.

great improvement in foundry design, and in the planning of modern buildings the most careful consideration is given to their design, and location, so that the fullest daylight illumination possible may be obtained throughout all seasons of the year. The importance of this is shown by an investigation made a few years ago by John Calder, of fatal accidents in the United States shops, which showed that the number of accidents in the dark winter months, was about forty per cent higher than in the lighter summer months.

Men work with a greater sense of security and exactness in the well lighted shop, and the spoilage is minimized.

Planning For Sunlight

To those of us who are familiar with the discomforts and inconveniences due to the poorly lighted condition of some of the older shops, it should be gratifying to see the improvements that are being made in the newer foundry buildings; where the closest attention is given to the lighting arrangements, to secure the greatest admission of daylight for the longest possible period.

That the location and surroundings are favourable to the best daylight illumination, should be the first consideration when building. That the design of the building will give the best results in lighting, is most important, the smallest details in this respect should not be overlooked. That projecting eaves, wide cornices and deep window recesses be avoided, that the light areas are sufficient, and provided, where possible, with operatable steel sash with angle shaped bars. The sash should be set continuously and if possible outside of all structural work. These are but some of the many details to be kept in mind when planning a building for sunlight.

Looking Backward

Let there be light! Many an old time molder whose experience and memory are not entirely dissociated from the old shop that was never planned, but just grew, will say Amen! to that, as they think of the numberless ages ago the vest forests and other forms of vegetation, which in time the dark recess of a mold by the sense of touch, or patched a vat at the bottom of a deep draw with the aid of a piece of faded mirror; or overlooked an obscured point, and perhaps dropped a toll in the mold and closed up the box—all for the want of sufficient light.

Clean Up and Brighten Up

Many of these old time foundries, some of them still linger in the land, could be greatly improved, and made more productive, if their owners could be made to realize, that a good general house cleaning would be to their financial interest. In many cases where the window light is inadequate, even under the best conditions, it is not unusual to find a broken window light, plugged with an old hat, or covered with a bottom board, and the glass that is intact, is usually so clouded and dust stained, that it shuts out two-thirds of the light that would be available, if the glass were clean. And those dingy corners harbours for unused flasks, bottom boards, and foundry tackle of all description? If they were cleaned out and brushed down, and a few barrels of whitewash sprayed on the dark walls, how they

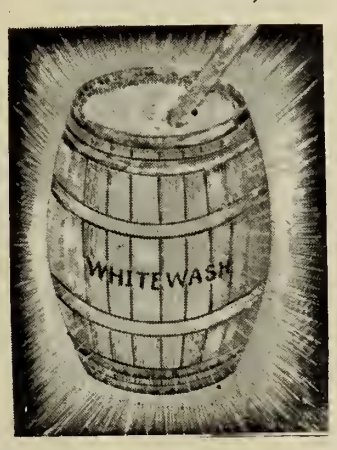


Fig. 5.—A barrel of whitewash is like sunshine.

would brighten up. A barrel of whitewash is like sunshine, when sprayed over dark vertical surface, like walls and columns. And when the right materials are used, and carefully applied, when dry reflects a soft diffused light, making conditions more cheerful for the workers in the shop.

There are sometimes portions of the foundry, where owing to the close proximity of buildings or for some other reason, that side light is not available. These areas could be greatly improved by whitening the walls. As an additional means of light, the placing of diffusing glass in the most favorably positioned windows, or the use of cast glass prisms, which would deflect the light into those dark portions, is suggested.

In many instances, light is available from above, if means are taken to secure it. An entire roof of glass is not impossible, or its cost prohibitive. Struc-

Fig. 6—An entire roof of glass is not an impossibility.

tural and corrugated wire glass for roofs and side walls is now being widely used in industrial building construction.

This glass is usually made in sheets identical in size and corrugations with the corrugated asbestos and metal roofing, and is said to be easily installed without the assistance of skilled labour. There are so many ways and means of securing and utilizing the sunlight, that it is almost criminal indifference to neglect their adoption in places where light is deficient.

The improvement of existing lighting methods and the development of artificial means of illumination have made wonderful strides in the last few years. But this subject is not within the scope or design of this article which is not intended as a scientific treatise on light, but as an effort rather, to point out and suggest means by which in buildings, the fullest advantage in lighting, may be taken of the sunlight, and to impress, if possible, upon those who may be responsible for conditions in the factory, not up to the generally accepted standards of lighting, the necessity and importance of Sunlight.

SYMPHONY

To be decent, to be fair; to take advantage of every chance the other man passes; to lose cheerfully and win without gloating; to remember always that someone else could do it better if a chance were offered; to realize that I am not such a heluvalot; to speak no evil; to think no evil, unless I find the other fellow with the goods on; to get an early start, take a short cut and follow the trail as long as I can; to live facing the front and to pass on without showing a yellow streak. That is my symphony.

Grinnell Company's Continuous Fitting Plant

Descriptive of the New Plant Recently Put into Operation in Toronto by the Grinnell Co., for the Manufacture of Cast Iron Pipe Fittings

By BENJ. TOWLEN

IN the June issue of Canadian Foundryman we published a short story on the new plant of the Grinnell Company in which we showed two views of the buildings—a front view and a rear view. In out story we discribed in a general way the lay-out of the buildings and a few details of the process of production in the foundry. We also expressed the hope that in a future issue we would be able to more fully illustrate and describe the various details which make up the vast chain of equipment which, when set in motion makes what would appear to be a single unit or one enormous casting producing machine. In the illustrations here shown will be seen the various features of interest, which, with the descriptive matter kindly furnished by Mr. Ben Fowler of The H.M. Lane Company will aid the reader to form some idea of what this plant like. Following is Mr. Fowler's article.

Grinnell Company's Continuous Fitting Plant

THE Grinnell Company, who handle the General Fire Extinguisher Company's business in Canada, have in the past either had to import their fittings from their plants in the United States or depend on purchasing Canadian-made fittings. Many of their fittings are highly special and have to pass very exacting tests and specifications. For some years they have had in Toronto a plant for doing the pipe work, assembling the general parts of the apparatus and making sprinkler-heads, and it was decided to add to this equipment a grey iron casting plant and a tapping shop. They already had sufficient land on Dundas Street adjoining their existing plant, and the problem was to lay out an efficient unit which could be expanded to take care of any likely increase in the demand for their product.

The H.M. Lane Company, Limited, with offices in Windsor, Ontario, and Detroit, Mich., designed the plant and the equipment and acted as the engineers in charge of the project. Their Detroit office handled the Warren foundry project for the same company.

The property is situated between the railroad and Dundas street, and at the end where the old plant is located is comparatively narrow but widens as it approaches the East. Sufficient area for yard purposes was left between the existing plant and the end of the new foundry and provision made for later extending the foundry to the end of the property. In like manner the tapping shop, the first unit of which has been constructed on Dundas Street, is so designed that it can be extended the full length of the Dundas face of the property and run up to a three or four story building.

Fig. 1 shown in former article was the front view of the property with the foundry building in the background and the tapping shop to the left. The portion of the tapping shop shown consists of a basement for storage purposes and a first floor for machine-shop and general tapping machinery. At the extreme left not shown in this illustration another story was added adjoining the old plant, and at present this is being used for office purposes.

The higher portion of the foundry building is the foundry proper, and the lower portion at the left behind the end of the tapping shop is the service building, in which are located a blacksmith-shop, the boiler room for heating the entire plant by a forced circulation hot water system, installed by the Grinnell Company themselves, the foundry offices, stockroom, first aid room and pattern storage. The sand tempering equipment is also located in this portion of the building, the tall tower housing the sand elevators. In Toronto all the foundry refuse is to be trucked away to a nearby dump, and hence the dust arrester is located at the front of the building, where a truck can be driven under the hoppers to remove refuse.

Fig. 2 showed a rear view of the building taken from across the railroad. At the right hand can be seen the coal storage behind which is the boiler plant in the service building. At the left is located the melting unit, which also contains the new sand storage for both molding sand and core sand. Melting stock is unloaded over the fence into the yard by means of gravity carriers or other devices and the material for charging is taken into the plant by a monorail extending the length of the yard as shown. This monorail also serves to take coal from an emergency coal supply to the boiler room.

The space under the charging floor was used as sand storage, the sand bins being approximately forty feet deep. The incoming sand is dumped into a track hopper from which an automatic feeding device takes it to the foot of the bucket elevator shown at the right of the melting unit, and the head of this elevator is enclosed in a suitable housing, as shown, and the sand conveyed across the top of the bins by a belt shown in Fig. 3. The sand is scraped off the belt by a travelling scraper into any one of the bins. This sand conveying system was designed by The H.M. Lane Company and furnished by the R.W. MacIlyaine Company, of Chicago. The equipment, however, was all fabricated in Canada. The sand bins are of sufficient capacity to hold enough sand to run over a winter's season.

Across the front of the sand bins on the ground floor level there is provision for taking the sand by monorail to the various parts of the plant where it is used—the new molding sand to the sand mixing machinery and the core sand to the core sand mixing unit. The core sand mixing unit is shown in Fig. 4 and is located directly below the coreroom. It consists of a Standard Sand and Machine Company's batch mixer discharging into an elevator furnished by the R. W. MacIlvaine Company. At the head of this elevator there are two sand bins for receiving the two principal mixtures used. These are shown in Fig. 5, which also gives a general view of the coreroom with the coremakers' benches on the right.

Under the sand bins there is an overhead platform which extends over the coremakers' benches, and the sand is wheeled from the bins to the benches and dumped into hoppers ready for the coremakers' use.

Particular attention is called to the windows or openings in the wall at the left of the coreroom that separates it from the foundry. Through these openings cores are delivered directly to the molders on the opposite side of the partition, thus minimizing handling.

After the cores are made they are put on racks and taken to the ovens for baking. The oven outfit consists of three rack type ovens as shown in Fig 6. The space to the left of this view is devoted to heavy coremaking and comprises two bays, one of which is covered by a small crane.

These core ovens are of the forced draft type and are fired from the ground floor by means of soft coal with a stoker outfit, as shown in Fig. 7. This stoker was furnished by the Hare Stoker & Furnace Company, of Detroit, and represents a new development in the firing of core ovens, mold ovens and certain types of metallurgical furnaces. The stoker is provided with a self-cleaning arrangement which works the ashes through into the ashpit.

The molding is done on the second floor in a space occupying a little less than two-thirds of the building. A general view of the molding floor is shown in Fig. 8. This view shows the side toward the coreroom On this side of the building is a long battery of Nicholls molding machines manufactured by the W.H. Nicholls Co., of Brooklyn, N.Y. which are used for making the smaller type of fittings. On the opposite side of the foundry is a battery of larger Nicholls molding machines and several Osborn molding machines, the latter made by the Osborn Manufacturing Co., of Cleveland. In the case of the Toronto plant only small and medium sized work is made on the second floor, there being a heavy work foundry on the ground floor which will be referred to later.

A more detailed view of one of the molding machines and its surrounding is shown in Fig 9. The molding sand is brought along a gallery over the molding machines as shown in Fig. 10 and is dumped directly into the bins, from which it is drawn into the molds. In the building construction provision was made for a special cushion foundation, which extends under these molding machines and minimizes vibration on the foundry floor.

In front of the molding machines shown in Fig. 9 there is a practically continuous grating for the shaking out of molding sand. In practice a molder places molds on approximately one-half of the area allotted to him, at the beginning of the gangway, and works back toward his machine on one side of

Interior Views of The New Grinnell Foundry, Toronto, The Last Word in Production.

By an unfortunate misunderstanding on the part of the artist, Fig. 3 was pl aced wrong side up. It was entirely unintentional, but may be the means of attracting attention to modern sand conveying appliances.

his floor. When this block of molds is completed the pouring gang pours them off, and while he is filling the second half of the floor the molds are shaken out and the flasks piled in position ready for him to use, so that in practice he has an unlimited floor area closely adjoining his machine, which reduces the distance he must walk in placing the molds to a minimum, and this naturally decreases the fatigue factor and increases the output. Each floor will be poured off from five to eight times a day.

Over each floor is an underslung crane as shown in Fig. 8, and on these there are pouring devices furnished by the E.J. Woodison Company. By means of these the pouring gang pours off the molds without the use of the ordinary hand or shank ladles.

At intervals along the floor there are casting chutes through which the castings are passed to the floor below. Fig. 11 was taken on the ground level below the foundry floor and shows on the right a series of casting chutes and in the foreground a grab bucket which takes the sand from the long sand bin and delivers it to the sand mixing hopper at the end of the building. This grab bucket is a Blaw-Knox bucket, and the monorail machine which handles it was supplied by the Northern Engineering Works, Walkerville.

In this plant the sand is retained in a series of hoppers when it is first dumped, but is subsequently released by the man in the monorail cage, who operates latches and controls levers and dumps the sand into the bin as it is required.

The sand handling equipment consists of a hopper into which the grab bucket dumps it, from which it is fed by an automatic feeder to an elevator. This elevator takes it to the top of the sand tower, where it is put through a revolving riddle as shown in Fig. 12. Under this riddle there is a Standard Sand and Machine Company's mixer, arranged to act as a pug mill, and the sand is wet down in this mill. From the end of the mill the sand discharges directly into a Sellers centrifugal mixer, and from that falls through into a large storage bin from which an automatic feeding device delivers it to the sand cats shown in Fig. 13. This illustration shows the bottom of the two sand storage bins with the sand delivery car in place under one of them.

As already stated the castings pass down the casting chutes into the first floor and the general arrangement of the central gangway under the molding department is shown in Fig. 14. The castings come down against baffle plates and are then forked into the tumbling mills immediately adjoining. After the castings are tumbled they are taken by means of the monorail to the grinding room, which is situated under the coreroom.

At the back of the room in Fig. 14 is shown a car under the tailing chute. The core butts, scrap iron, etc., are taken out by the revolving riddle at the head of the sand tower and come down this tailing chute and land in the refuse car as shown.

A view of a portion of the sorting and grinding room is shown in Fig. 15. These grinders were supplied by the Ford-Smith Company, Hamilton, Ont., and are belt-driven from an overhead gallery.

The castings as they come in on the monorail are dumped on the sorting benches and sorted on to trucks carrying shallow boxes as shown. These boxes are put close to the grinding machines, and after grinding the castings are either thrown into similar trays, into tote boxes or into tote barrels and then transported to the tapping shop.

As already stated the melting unit is built on the side of the building, and the melting stock comes into the melting unit on a monorail. The tubs or boxes of iron are set on small cars, run onto a platform elevator and taken to the charging floor. Fig. 16 shows the cupola and a portion of the charging platform. At the time this picture was taken the trucks for the trucking system had not yet arrived. The charges are made up on the Toledo scale shown in the illustration. As soon as a charge is made up it is put on a suitable truck and pushed to the cupola. The back scrap and sprue from the cleaning room comes up on the same platform elevator that brings up the pig iron, foreign scrap and coke.

Owing to the fact that this melting unit projects from the general body of the foundry and is treated as a separate unit, it is provided with continuous sash on all four sides so as to give maximum ventilation for the melting room. The cupola is a Newton cupola, supplied by the Northern Engineering Works, and as shown in Fig. 15 is provided with screen doors. The sash was supplied by the Canada Metal Window and Steel Products, Ltd. of Canada.

The blower is located on a mezzanine floor immediately behind the cupola, as shown in Fig. 17. It is of the positive blast type Manufactured by the P.H. and F.M. Roots Co. Connersville, Indiana. The right-hand wall of the blower room as shown in this picture is one wall of the sand bins.

A receiving ladle is used in front of the cupola, and the metal is poured from it into large ladles on the monorail system for delivery to the molders.

For heavy work castings a special heavy work bay was constructed adross the end of the foundry, as shown in Fig. 17. In this bay are located several large Osborn roller-over and one plain jar ramming machine. The hot metal is delivered by means of a monorail to an overhead spur and dropped through to the floor level and is then handed by either one or two travelling cranes. There is a light travelling crane on the level of the general foundry floor, as shown, and there is a heavier travelling crane running at a higher level which can be used for rolling over fairly large flasks, for handling loom rigging if large castings are required and for doing any odd jobs that may be required.

The Canadian plant, unlike any one of the American plants, had to be designed for handling the smallest and largest fittings that were likely to be required while in the States they have one foundry that specializes on the heavy work and two foundries for the light and medium work

All cranes were supplied by the Northern Engineering Works and the tumbling barrels by the Whiting corporation. The general contractor was the Anglin-Norcross Company, the plumbing was installed by the Purdy-Mansell Company, and the electrical wiring was done by the Canadian-Comstock Company. W.D. Beath and Sons, Limited, furnished the monorail system.

The plant is sprinkled throughout with sprinklers installed by the Grinnell Company The Grinnell Company also installed the heating system.

The following captions will make the illustrations more properly understood.

Fig. 3. Conveyor belt for delivering sand into storage bins.

Fig. 4. Core sand mixing unit.
Note—The sand is brought to this location by the monorail and is put through the Standard Sand and Machine Company's batch mixer, which discharges directly into the boot of a bucket elevator leading to the storage bins in the coreroom.

Fig. 5. General view of coreroom.
Note—The core sand lands in the elevated bins shown suspended from the roof trusses and is discharged from these into carts or wheelbarrows on the elevated platform and then dumped into bins immediately over the coremakers' benches and the coremaking machines.

Fig. 6. Forced draft core ovens.
Note—These ovens are located on the coreroom level, which is the second floor of the building, and are fired from the ground floor.

Fig. 7. Stoker fire box for firing core ovens.
Note—This is equipped with an underfeed stoker which cleans its grate automatically and burns the fuel smokelessly.

Fig. 8. General view of foundry floor.
Note—The molding machines are arranged along both sides of the foundry floor, hot metal is delivered along the central gangway and pouring is done by underslung cranes and pouring devices as shown.

Fig. 9. A detailed view of the molding machine arrangement.
Note—Molding sand is dropped directly into the flask from an overhead bin, and a shake-out grating is provided in front of the molding machines for delivering the old sand to the floor below.

Fig. 10. Sand gallery for delivering sand to the molding machines.

Fig. 11. Detail of sand handling arrangement on first floor.
Note—Molding sand from the second floor is discharged into bins and from them into the long shake-out bin shown. From the latter it is transported by monorail grab bucket to the sand mixing unit. At the right can be seen a series of casting chutes.

Fig. 12. Head of sand mixing tower.
Note—the sand coming up the elevator passes through the screen into the pug mill, where it is wet down and subsequently discharged into a Sellers mixer and from there into the sand storage bin.

Fig. 13. Bottom of sand storage bins for tempered molding sand.

Note—These bins hold sufficient sand for a half day's run. The sand is delivered from them to sand cars by an automatic feeding device and then transported to the bins over the molding machines.

Fig. 14. Ground floor of foundry building.

Note—The castings coming down the casting chutes land close to the tumbling barrels where they can be forked directly into the barrels. They are then transported to the grinding room by means of the monorail.

Fig. 15. Grinding and sorting room.

Note—The castings are handled from the sorting benches to the machines on wheeled trucks having shallow bins. so as to minimize labor in handling individual castings during grinding.

Fig. 16. Charging platform.

Note—This platform is made large enough to carry a sufficient stock for several days' melt, so that it will not be necessary to send the men out in a severe storm.

Fig. 17. Blower room.

Note—This room is located on the mezzanine floor immediately back of the cupolas.

Fig. 18. Heavy work molding bay.

Note—In this bay the molding is done on the ground level and the hot metal is passed down from the floor above.

JOHNSON & SON FILL BIG CONTRACT

In addition to the installations described and illustrated in the above article there are other items of interest which should not be overlooked. In Figs. 5 and 8 will be seen numerous flasks and bottom boards, but these are only a few. While no great number of molds are allowed to be on any floor at one time the number of floors running calls for an enormous number of boards. And since flasks are used for the larger sizes of fittings an enormous number of spruce molding flasks are used. The smaller sizes of fittings are molded in scrap flasks, and this calls for a considerable number of snap flasks of different sizes and depths. The smaller sizes of patterns are of metal and are fitted to the machines but the larger ones, while bolted on the larger sized bolt machines are made from loose wooden patterns, and these patterns with the core boxes represent a big outlay. All of the spruce molding flasks, cherry snap flasks, the bottom boards and the wooden patterns, together with the hard wood mallets and wedges were made by I. Johnson & Son, Limited, 1586 Dundas St., West, Toronto. These items alone amounted to between fifty and sixty thousand dollars. The method of making the wooden patterns was novel and is worthy of note. In order that the patterns be rigid and free from warp they were built up with alternate layers of mahogany and white pine, and after being glued together were put under heavy pressure which forced the hard mahogany grain into the softer pine, thereby making a substantial job.

The I. Johnson & Son Works

The works of I. Johnson & Son is admirably adapted to such contracts as that of the Grinnell Co., having, as they have, a floor space of five thousand square feet, with twenty four machines of different kinds for doing wood work. They also have steam heated dry-kiln and glue room. When running to capacity they employ sixty-two men. At present they are not running to capacity, but are fairly busy.

New Facilities For Doing Thermit Welding

Eliminating Blow Holes In Thermit Welds By The Use of New Molding Material And New Style of Mold Box

A NEW grade of molding material for thermit welding has recently been developed by the Metal & Thermit Corporation, of New York for repairing roll necks, pinions, crank shafts, locomotive frames and other heavy steel sections for steel plants, which as proved by extensive researches and practical experiments, when used in accordance with the regular thermit practice, will definitely prevent blowholes and secure sound welds. This new molding material has already been introduced in many of the large railroad shops, where the beneficial results obtained therefrom have won enthusiastic approval. The new material, designated as "Thermit Molding Material" is quite different from ordinary molding material and in all Thermit work, either this, or a substitute which has been tested and approved by the Metal & Thermit Corporation should invariably be used. In view of the great importance of using this new molding material, it is now being sold practically at cost.

The design of the new molding material is based on the theory that good silica sand will stand the heat of the thermit reaction very well and that the weakness in all molding material is the clay binder. Therefore there should be as little clay as possible in the mixture, in order to make the mold more refractory and increase its porosity. It is logical therefore, that the use of a plastic clay be selected instead of a fire clay, as formerly. The sand and plastic clay are ground together in a foundry pan or moller, with the intention of coating each grain of sand with a minimum thickness of clay. This has resulted in a good, clean molding material, which should be rammed hard in the mold, which will stand up well under the preheating flame and which is extremely porous to the gases generated in the mold, resulting in a sound weld with a very clean exterior. Although suitable molding material can be made by increasing the clay content slightly and mixing the clay and sand thoroughly by hand, it is not as good as that made with a smaller clay content in the foundry pan or moller.

The mixture now being used is composed of the following: 3 parts clean, sharp silica sand, (100% of which should pass through a screen having a .03 in. square opening, and 40% of which should be retained in a screen having a .012 in. square opening) mixed with 1 part Welsh Mountain plastic clay. These parts are first thoroughly mixed in the moller together with 1/40th part glutrin by volume and sufficient water (1/12th part) to bring to the proper consistency. If mixed by hand, the sand and clay must be dried before mixing (being careful not to subject the clay to a temperature higher than 400 degrees F.) and thoroughly mixed before adding the glutrin and water. The glutrin should be mixed with the water before adding to the sand and clay.

In case a plastic clay fatter than Welsh Mountain is used, the mixing, of course, will have to be more thorough and more clay used. Welsh Mountain clay is being used in the present mixture because in carefully run tests it has proved to be the most refractory. The use of the new molding material necessitates harder packing next to the weld; in fact, the regular Thermit rammer may be supplemented by the use for instance, of a tool having an end 3/8" x 1½", so that the operator may be able to peen the sand next to the wax collar and the various patterns.

It is absolutely essential, in the production of sound welds, to be sure that no loose sand exists in the mold when the Thermit steel is poured. This is why very hard ramming is advocated, also why it is most important to blow out all loose material from the interior of the mold by putting the preheating burner in the riser before the heating gate is plugged and being sure that no sand is detached by the operation of inserting this heating gate. The burner should be removed from the riser before plugging the heating gate, because otherwise it may detach some sand, which could not be blown out after the plug is in place. The heating gate plug should be thoroughly dry; and, if it has been carried in stock for some time, it should be warmed before using.

By perforating the sides and bottom of the mold box, the escape of the gases which pass through the molding material is greatly facilitated, ⅜ dia. holes, spaced 3 or 4 in. apart, are sufficient. To facilitate the escape of the gas from the bottom of the mold box, the mold should rest on blocks, not directly upon

the foundry floor. As unnecessary molding material simply increases the resistance to the passage of gas, the mold box should be made as small as possible commensurate with safety. For example, in welding a 4 in. by 4 in. section, only about 4 in. of sand is necessary at all points, except, perhaps on the pouring gate side. It is most important to thoroughly vent the mold box by forcing a rod or wire down at a number of points to within ½ in. or so of the collar. Care should be taken that these do not touch the collar because such vent holes will fill with steel and will therefore not facilitate the escape of gas.

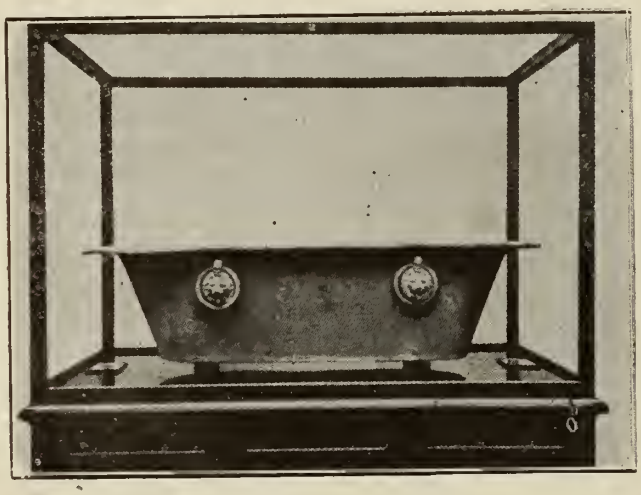
Bronze Antiquities From Boscoreale

A Bath Tub of Similar Design to the Present Standard Pattern and Showing Rare Artistic Workmanship

By F. H. BELL

IN the last issue of this publication I began a little story relating to antiquities which have been unearthed at the side of Mount Vesuvius, but for fear of wearying my readers I drew it to a close before I arrived at anything which would in anyway connect itself with the foundry business. However, I promised that I would have something real this time. Now the same fear has overtaken me again, because I may not be able to give much enlightenment on the foundry end of it, after all.

The piece which I have selected for this time is a bath tub. As will be seen by the illustration, it is enclosed in a glass case. This case is, of course, modern, but the bath tub as it is seen resting on the two blocks is just as it was taken from the villa in Boscoreale a short time ago, after remaining there hidden under one hundred feet of earth since August 24th 79 A. D. or one thousand eight hundred and forty two years ago this summer. The tub is in a good state of preservation, except for some cracks which were rudely repaired before it entered the museum. It is covered with an oxidation of various shades of green and iridescent blue.



Cast bronze bath tub made in the first century.

The body of the tub consists of five pieces of cast bronze, that is, two sides, two end-pieces and the bottom. These pieces are carefully fitted and brazed together as mechanically as any brazier could do them today. These seams are easily discernible. —the one to the left of the illustration. The side and end pieces are turned over at the top, and hammered so as to form flat rims, the outer edges of which are turned under in a sort of roll. Through this roll passes a heavy iron wire. The lower edge of side and end pieces is turned under at right angles, thus forming a ledge upon which the bottom rests, protected from contact with the floor.

The shape of the tub, as will be seen is similar to that of modern tubs. The sides slant but slightly outward. The ends have a more gradual slope. The rims, which are wider at the ends than at the sides are both leveled at the inner edge. At one end of the tub and near the bottom was a hole through which the tub could be emptied

Four handles, two on each side, are riveted on otherwise the tub is entirely destitute for ornament. Thehandles are interesting and it is hardly believable that they represent the handiwork of artizans who wrought so many years ago. They consist, each of two pieces, which are cast separately, namely, the attachment and the ring or handle proper. What I have termed the attachment is a rounded plate with ears, through which pass the rivets which hold it onto the tub. The rivet heads look as familiar as though a boiler maker had just completed them today. This plate serves as a background for a lion's mask, from the top of which rises a flat projection, which forms a sort of elbow, the other end of which is riveted to the side of the tub. The front of this elbow is represented as covered with hair parted vertically in the middle, a somewhat loosely carried out suggestion of a piece of lion's skin. The mask has the mouth open with teeth visible and tongue protruding. The eyeballs and lower lids are indicated. The pupil is shown by a small indentation. Around the face is a fringe of mane. The ring, or handle which is large enough to slip over the mask, but not over the plate, is channeled, except on the inside.

The lions' masks are excellent in design and technique, but are said to be somewhat less spirited than a ring-holding mask taken from another excavation, which is otherwise rather similar. They are also said to lack the charm of style which exists in the typically not very different lions' heads in the gymnasium at Priene (where ever that is) belonging to the second century B.C. This may all be true, and since it has not been my privilege to see these others I will take it for granted. Those which I was privileged to inspect looked all right to me.

Although bathing had been practised by the Greeks since the days of Homer, and by the Romans of the republican period, only a few bathing vessels have survived from antiquity. In the Naples Museum there are said to be a couple of bronze tubs taken from the ruins of Pompeii. At the museum of Louvre there is also said to be a marble tub with fluted sides and ornamental lion-mask handles similar to those just discribed.

Before parting with our Boscoreal bath tub I might say that it was of a fair average size. The inside measurements at the top were, length six feet two inches, width two feet and four inches, and, as we have already pointed out, tapering a little bit towards the bottom. It had a depth of about one foot and nine inches.

So much for the bath tub. In my next story I want to tell my readers about a bronze table which was taken from this same villa. This table was somewhat more artistic than the tub and according to history bearing on the customs of those days it was a dining table. Dining was done differently in those days to what it is now, but if I tell all about it now I will not require to do so in the next number so I will close for the present.

WOODISON CO. OPENS BRANCH AT MONTREAL

The E. J. Woodison Company, manufacturers of and dealers in fountry supplies and equipment with head office at 858 Dupont St. Toronto, have opened an office and branch warehouse at 261 Wellington St. Montreal, to take care of their increasing business in the Maritime Provinces, Quebec and Eastern Ontario. The new branch is under the management of Mr. J. A. Taylor and J. H. Jerosky. A view of the office and warehouse is shown in another section of this publication.

COWS ON BOTH

A bunch of Chinese boys were discussing the relative merits of two billboards, one advertising Carnation Milk, the other Bull Durham Tobacco.' One boy was explaining:—"In Canada, you know, they have he-cows and she-cows. The she-cow gives milk but the he-cow gives tobacco.

PLANING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery Equipment, etc., Used in the Plating and Polishing Industry.

Question:—Can you give me a receipe or formulae for polishing nickel articles which have lost their luster but which have not become corroded?

Answer:—Nickel-plated asticles which have become dull can be readily rendered bright again by means of alcohol to which has been added two per cent of sulphuric acid. The liquid is applied liberally and after a few seconds is washed off with clean water. The surfaces are then rubbed over with a swab dipped in fresh alcohol, containing no acid, and finally polished with a dry cloth. This method will give brilliance to the dullest piece of nickel-plating without damaging it in any way, providing of course, that the nickel has not rubbed off or been allowed to become rusted, in which case it will be greatly improved but not made like new.

Question:—For the process of cleaning petroleum oils from steel sheets and tubing we sometimes find it necessary to allow the steel to remain in the cleaning solution for several hours. The solution used is a mild alkali and is employed as a simple immersion cleaning bath. No electric current is connected to the bath. The solution is heated by means of steam coils and the tanks are of sheet steel resting on wooden blocks. Tubes remaining in the solution more than one or two hours become seriously corroded in spots where two tubes are in contact; the corrosion is equally as destructive to one tube or sheet as to the other in contact. Red oxide of iron forms in considerable quantities and the surface of the steel is so deeply attached that a special operation upon the polishing wheel is necessary to remove the defect. Can you tell me what is the cause of all of this trouble and how I am to proceed to have it stopped, as it is a terrible nuisance and not only delays the work but adds greatly to the expense? We do the cleaning in our plating department before plating the goods.

Answer:—The corrosion which is causing you all this trouble is known as chemical decomposition and is caused by means of an electric current. In your case the sheets and tubes are the iron electrodes and being suspended in a solution of alkaline metals or earths, the salts of these alkaline earths or metals are decomposed, and their acid radicals attack the tubes and sheets forming an iron salt. The action is very similar to the action of an electroplating bath, a current of electrical energy is instituted from one piece to another and the object from which the current flows is corroded. Induced currents are often strong enough to corrode metal, even when the conductors are of adequate size. Less than .005 volt establishes electrolysis, the amount of which is in proportion to the amperes present and not to the voltage. To prevent the electrolytic action in the cleaning bath, insulate the steam pipes entering and leaving all steel tanks where electric current is used, replace the wooden blocks with new dry blocks and as a further precaution place half inch plate glass between the bottom of the tank and wooden block. If you are using one of the many cleaning compounds now commonly used, which contain certain percentages of aluminum oxides, use 4 ounces of soda ash per gallon of the solution. Rods across the top of the tank should not rest directly upon the edge of the iron ends but upon wooden strips or a wooden frame may be made to fit the frame.

Question:—I have been making a lot of brass goods to be used in connection with ships compasses. These, I might say are all nickel plated. Recently I have received complaints regarding them. They seem to be magnetized, some seriously and some not so bad. I have worried a lot over the matter and have done some experimenting. I find that if we do not plate them they are all right so I have concluded that the trouble is in the plating, but this has an unexplainable feature inasmuch as we have some parts which were plated, a few years ago in the same solution, by the same man and in precisely the same manner, and when we try these they are found to be absolutely free from the defect which is troubling us now. To use a slang expression, I am getting about fed up on them. Can you solve the mystery?

Answer:—There are a number of different causes any one of which may be responsible for your trouble. Iron objects lying at the bottom of the bath and being acted upon by the solution, or by the current and solution if causing a slight short circuit at intervals would possibly account for results being better on one day than on other days. Iron from the nickel anodes or nickel salts will contaminate the nickel solution in a similar manner and affect the deposit. Iron hooks dipping in the solution are also liable to corrode sufficiently to cause annoyance. The best remedy, in our opinion would be to thoroughly clean the tank and then use high grade single salt solution and purest nickel anodes obtainable. Take particular pains at all times to prevent iron or steel objects from remaining at the bottom of the bath, if by any means such material happens to be dropped in. The condition of the finished goods is not caused by the quality of the brass used, neither will the thickness of the electro plate affect the magnetized condition, a thin plate being practically as conducive to the trouble as a thick plate.

Seattle.—The steamship "Friesland," a former German vessel, recently left this port with the largest cargo of wheat ever shipped through the Panama Canal. The "Friesland" is now owned by the British Ship Controller and is bound for Avonmouth, Bristol Channel. The cargo consisted of 504,597 bushels of wheat, and it is said to be not only the largest cargo of wheat to be shipped through the Canal, but the largest ever put aboard a single vessel on the Pacific Coast.

New branch of The E. J. Woodison Co., 261 Wellington Street, Montreal.

The "Lectromelt" Process for Making Grey Iron

The Electric Process and the Cupola Method Compared as to Quality of Material and Expense of Operation

By H. E. Bromer

ELECTRICITY furnace grey iron is rapidly gaining favor. Although not entirely unknown heretofore, its general production and use has been but recent. It is known to possess superior metallurgical and physical properties. As competition with steel foundries and with other grey iron foundries has become more keen, it is but natural that a demand has arisen for a more efficient means of producing a superior gray iron product.

Competition in The Gray Iron Industry

Whereas, the steel industry has advanced rapidly through the stage marked successively by the adoption of the crucible, the converter, the open-hearth, and finally, the electric furnace process, the grey iron industry has clung stolidy to the one process in use long before the possibilities of steel production were so well known, namely, the cupola process. Judging by the unusual interest already indicated by the grey iron foundrymen in all parts of the country and the results thus far attained by the bolder ones who have tried out the newer process to their marked satisfaction, it is safe to assume that the timeworn and faithful old cupola has found a real competitor in the modern electric furnace.

Reasons For Delayed Application

One may well question why the iron foundrymen have not adopted this new and comparatively well-known melting process more quickly. Electric furnaces have been used quite generally in the steel foundries of the country for a dozen years or more. This question is not hard to answer. The cupola could be quite cheaply constructed, the melting cost under normal conditions was comparatively low, and the process was universally well known. Furthermore, a demand for high quality iron castings did not exist a few years ago. On the other hand, the electric furnace has unfortunately been surrounded with more or less mystery, as well as doubt. Until recently, they have been rather cumbersome affairs slow in operation, quite inefficient and somewhat high in first cost. Likewise, the demand put upon the furnace builders to produce more satisfactory melting units for the needs of the steel industry have been such as to cause them to overlook the growing necessity for more desirable melting units in the iron foundries.

Demand For High Quality Castings Increasing

The past four years have brought about changed conditions. Those who recognize them have opportunity to profit by the knowledge, whereas those who fail to do so will doubtless be less fortunate. These changed conditions have taken just as strongly in the iron industry as in other lines of business. The costs of pig iron, coke and labor, the principal items in the production of cupola iron, have increased enormously. High freight rates, which largely account for the high prices of the first two items, show no tendency to become lower. The demand for high-grade castings is increasing rather than diminishing with the more intense competitive situation which confronts the grey iron foundrymen. What, then, is the particular solution of the problem he faces? Can he make any mistake by investigating the possibilities of methods claimed to offer opportunity for the production of better castings which will sell for maximum competitive prices and which in many instances can be produced at lower first cost with a higher percentage yield and fewer returns of defective castings? The answer to the question is self evident to the one who will approach the subject with an open mind. No progressive foundryman can safely rest on his oars at the present time.

On account of the many inquiries which we have received from foundrymen on the subject of melting grey iron by electricity we publish this article which we believe will interest our readers. Many founders look upon the electric furnace as a special steel melting device, while others fear that it would have a different chemical effect on the resultant metal which would have to be understood before good castings could be produced, and do not care to run the risk. But there are many who would gladly make the installation if they really believed it would be a success, and it is for these that we publish this article, leaving the reader to be his own judge. The word "Lectromelt" which is used so frequently is the trade name of the particular furnace with which the writer of the article is acquainted. Editor.

High Quality 'Lectromelt Iron at Low Cost

Let us then consider some of the principal points in the design and operating features of the modern electric furnace which have placed it in position to actively compete with the cupola in grey iron practice. The matter of favorable production cost is of first interest and this has been solved by development of the **'Lectromelt** process for making all grades of high quality cast iron from cheap cast iron and steel scrap, such as machine shop scrap consisting of iron borings, steel turnings, and unused machine parts, without the use of any pig iron whatever. This assertion is often questioned by grey iron foundrymen who are unfamiliar with the process. It is a proven fact, nevertheless, and specific instances can be shown where high-grade soft-grey iron castings are regularly produced by the **'Lectromelt** process from a charge of light steel turnings and iron borings, and with less melting loss, lower production cost and a higher percentage of perfect castings than is possible with the cupola charged in the usual manner with heavy machinery scrap and pig iron. Although the process has not been advertised to other than users of **'Lectromelt furnaces**, prospective buyers of **'Lectromelt** furnaces are given opportunity to witness actual demonstration upon request.

Comparative Operating Cost

Assuming, if you please, the above statements to be correct, the following comparative cost table is submitted on the basis of "Iron Age" quotations of January 6th, 1921 (Cincinnati District, which is a central point), for the assumed charge of a one-ton. **'Lectromelt** furnace and a 36-inch Cupola lined to 27 inches, each having approximately the same daily tonnage capacity:

Cupola Process	
1,000 lb. Heavy melting scrap @ $19.00	$9.50
1.000 lbs. No. 2 Foundry pig @ $38.00	19.00
160 lbs. 8% melting loss @ $28.50	2.27
333 lbs. Foundry coke @ $12.00	2.00
Cupola repairs	.40
Cupola labor	2.63
Power	.60
Cupola iron at spout	$36.46

'Lectromelt Process	
2,000 lbs Mixed borings and turnings	$5.50
4% melting loss	.22
6 lbs: Graphite electropes @ 25c	1.50
50 lbs. 50% Ferro- Silicon @ 4c	2.00
75 lbs. Coke @ $12.00 per ton	.45
Furnace labor	2.00
Refractory repairs	.30
550 k. w. h. Power @ 1½c	8.25
'Lectromelt iron at spout	$20.22

The quotations for the Cincinnati District have been shown as it is a territory in which the cupolas would show up to good advantage, due to the low cost of pig iron and coke. It can readily be seen that by substituting the present market quotations in another district, such as the West or South, the tabula-

tion would show production costs in many cases to be more favorable to the 'Lectromelt furnace, principally on account of freight charges for the melting charge.

The Cupola Process

Those familiar only with cupola methods are inclined to question the superiority of the product turned out by the 'Lectromelt process. It is necessary to analyze the two in order to make this point clear. In the cupola process the pig iron and scrap are elevated to the charging platform and dumped along with coke through the charging door of the cupola. Successive layers of fuel and iron are thus built up in the shaft. A fire having previously been started in the hearth, the air blast is turned on to promote raid combustion and melting of the iron. Gradually the molten iron trickles down through the melting zone and settles below the tuyers through which the blast enters. As it does so it comes in contact with the white hot fuel and slag, as well as the oxidizing flames of the air blast. The result is that the molten iron picks up impurities in the form of sulphur from the coke, foreign matter from the slag, as well as oxides and gases from the flame, during its downward course. If light metal, such as borings and turnings are charged, much of it will be oxidized and pass into the slag and out the stack. Unless the metal charged and the coke used are of good quality and low in sulphur, the molten metal is certain to contain excessive quantities of this undesirable element. No practical method of ridding the iron of sulphur or the other impurities which it picks up has been yet devised in cupola practice. The castings produced by this method cannot, therefore, be considered as being of a quality which would be attained were these difficulties removed.

'Lectromelt Castings Higher Quality

These facts being apparent, the possibilities of the Moore Rapid 'Lectromelt furnace can better be understood. The metal is charged by hand, or by means of a charging device directly into the furnace and on to a clear hearth. No fuel is added. The charge comes in contact with no sulphur impregnated coke or foreign matter other than the refractory lining and the pure carbon or graphite electrodes. No air blast is employed, and, in fact, the furnace is made practically air tight. It is obvious, therefore, that the metal can absorb no impurities, because none are present in the charge other than those actually in the metal when placed in the furnace. Furthermore, unlike in cupola practice, certain of the impurities, such as sulphur, phosphorous, obnoxious gases, oxides, slag, etc., in the metal, under the intense heat of the electric arc, can readily be worked out of the molten charge, and such elements as carbon, silicon, manganese, etc., can be either added or removed at the will of the operator.

To one giving the matter a little thought these features of the 'Lectromelt furnace call not but have a deep significance in portending its future prominence in grey iron practice. With this process the silicon and manganese need not be burned out, or the sulphur and phosphorus built up, as in the cupola. A rather high silicon content is very essential in grey iron because it has the properties of precipitating the combined carbon into graphitic carbon, thereby producing a casting of a fine grain soft nature, which is more easily machined. It is thus apparent that in charging the 'Lectromelt furnace a less expensive metal, low in silicon, may be used; the carbon analysis adjusted in the bath; and the proper silicon content be added if desired shortly before tapping. Such procedure is not practicable in cupola practice and the makeshift of charging the more costly high silicon pig is the only alternative. The metal must be cast as it comes from the cupola and no opportunity is afforded to correct its defects.

'Lectromelt Metal Handled in Reducing Atmosphere

In many grey-iron foundries attempts have been made to counteract the evil effects of too much sulphur by copious additions of ferro manganese to the cupola charge. Manganese undoubtedly neutralizes sulphur to some extent, but very little of it ever reaches the metal in the cupola hearth because it is unable to withstand the oxidizing influence of the furnace blast. In contrast to this, ferro alloys of any nature may be added in the reducing atmosphere of the 'Lectromelt furnace bath whenever desired, with the positive assurance that very little if any alloy will be lost by volatilization or oxidation. The absence of air in the furnace (or the reducing condition) prevents oxidation and retains the volatile elements in the bath. It is seldom necessary to add more manganese to the metal when using the 'Lectromelt process than is contained in the material charged. Unless some very special grade of iron is being produced, the silicon content and the temperature are the ouly features of operation that are given attention, and these can be determined at any time during the heat by simply taking a spoon test and examining the sample when fractured. 'Lectromelt grey-iron castings are universally soft, fine grained, uniform and free from blow holes and slag when properly made.

Temperature Control

It is often difficult to get cupola iron hot enough for pouring small, light or thin section castings without running the phosphorus excessively high. Another limiting feature of the cupola is that the metal begins to cool as soon as it drops onto the hearth, and the heat must be tapped before it becomes "too dull" for pouring into the moulds. In case of delays in preparing to take the metal when it is ready for tapping the heat cannot be held long in the ladle. It must be taken out and pigged, or otherwise disposed of. Often, when the iron cannot be gotten sufficiently hot in the cupola to make it run rapidly, high phosphorus pig is used. The phosphorus exercises the desired influence of making the metal more fluid, but it tends to produce "cold shortness" or brittleness, and weakness in the castings when removed from the moulds. It is very often used in making stove plate and other light castings, the brittleness and weakness of which are well known.

Easy Regulation of 'Lectromelt Temperature

In marked contrast to these well-known difficulties, the temperature of the bath in the 'Lectromelt process can be varied at will, held at a given point for several hours if necessary, and poured at temperatures much higher than are attainable in any type of cupola constructed. In fact iron containing only a trace of phosphorus can be rendered extremely fluid and can be poured from the 'Lectromelt furnace into the smallest or thinnest section castings produced in the best modern foundries.

Well Adapted to Foundry Practice

The 'Lectromelt furnace lends itself especially well to foundry practice. Instead of being tapped, as is the cupola, it is tilted on its trunnions by either hand or motor control, so the hearth may be partially or entirely emptied after each heat. It is more easily charged, no elevator and platform are required, and the charge is simply shoveled through the charging door by hand, or it is crane-handled by means of a special charging chute, which dumps into the furnace. Small or large heats may be made as desired. A 200% overload is not uncommon when an especially large casting is to be made. The heats come quickly (one hour or less being necessary for melting down a cold charge), less floor space is therefore required for setting up moulds than if larger heats were taken off at longer intervals. It can, however, be operated intermittently and allowed to cool down between heats with comparatively slight loss in efficiency. Less time is required for repairs patching and relining than with cupola. The bottom requires very little attention between heats; the side walls usually last from 500 to 800 heats and the roof has a life of from 100 to 350 heats. The walls may be relined in from two to four hours over a week end, and the roofs may be changed in ten minutes time when necessary.

Superior Design and Operating Features

Ton for ton rating, the 'Lectromelt furnace will turn out more metal than any other melting unit of its type. This rapid operating feature results in power, electrode and refractory economies, as well as in saving of first cost of equipment to produce a given daily tonnage output. It also insures a more compact unit occupying less floor space in the foundry than does the cupola or other melting units. The 'Lectromelt furnace is the outcome of years of experience in foundry and furnace de-

sign. No expense has been spared to make it the best that money can buy. It is practically fool-proof. Less skill and labor are required in its operation than in the handling of a cupola. A new man can learn to operate the 'Lectromelt more certainly and quickly than he can the cupola furnace.

Reduced Overhead Costs

Other advantages in favor of the 'Lectromelt furnace in comparison with the cupola are its reduced fire hazard and lower insurance rates, also lack of necessity of tying up valuable space and capital for the storage of pig iron, slag and coke. The worry attached to getting shipments of these materials when needed and the operating investment required for keeping them in stock, are also avoided. A few truck loads of scrap can usually be obtained in almost any community on very short notice in case the regular melting stock runs short.

'Lectromelt Products

Some of the special uses to which 'Lectromelt iron may be applied are in the manufacture of high-temperature and pressure pipe fittings, the making up of strong long-wearing pistons and piston rings, and other gas and steam engine parts subject to great wear and stress.

Heading off Competition

The competition met with by the gray-iron founders has not been confined to that of his neighbor in producing cheaper or better irons. On the contrary the steel founder has been encroaching on him more severely on account of the gradual substitution of steel castings for gray-iron. Steel, with its greater strength ductility and valuable properties, has taken the place of many parts heretofore made of ordinary cupola iron. The result has been that the gray-iron founder, instead of attempting to improve his own product, has turned to the manufacture of steel castings in the desire to hold his business. In fact, the majority of steel foundries in the country are today owned by former iron founders.

Diversified Application

The 'Lectromelt furnace, therefore, offers an unusual opportunity to the iron founder to not only improve his own product, but to branch out into the steel industry as his business justifies. With this type of melting unit installed, he can, in fact, turn out gray or malleable iron, semi-steel, steel castings, alloy steels, or high speed steel with equal facility as desired. In other words, he can perform the operations of the cupola, air furnace, crucible, converter or open hearth furnace as the necessity arises.

From this, the advantage of the 'Lectromelt furnace for installation in jobbing foundries, or in the plants of large manufacturing enterprises requiring a wide variety of steel and iron castings, can be seen. The extent of its applications are quite without limit at the present time. The furnaces are built in eight standard sizes, varying from a normal rating of 250 pounds to twelve tons per heat, and it is interesting to note that the smallest sizes will perform the varied operations for which they are built, equally as well as the larger ones.

Making (at) a Lead Keel, by a Juvenile "Man"

The Moulding and Pouring Were Done All Right but the Melting Was Done All Wrong

By F. H. BELL

THE article on casting a ten ton keel in last issue of Foundryman while being a practical article showing how a lead casting weighing several tons can be profitably made in an ordinary foundry had a particularly interesting phase apart from being an interesting piece of foundry work. I mean to say it had for me, if not for others in the business. It reminded me of my boyhood days when I posed as a sort of a manufacturer on my own hook. I made a lead keel myself once and as everyone has done some things in his life time which he would leave undone if he had his life to live over again, this is one of the things I would leave undone unless I first took some lessons on how to melt lead.

Since I have admitted that I, along with the rest of the world, have made mistakes I might as well admit that it has been a hobby of mine all through life to make mistakes. However, to get back to this lead keel, it will be difficult to explain how I came to get the order without first explaining a few other things. As I have already stated I was only a boy at the time, but I thought I was a man. I had served my time as I supposed and had become quite proficient in the art of molding plow shares and sundry lines of work so I decided that I would make a good early start and get into business. My childhood and youth had been spent in the little town of Dunnville, and in this little town I decided to make my start and incidentally my fortune. But before proceeding further it might be as well to say something about Dunnville.

Perhaps some of my readers have never heard of Dunnville, but I guess they have. It is a favorite watering place where everybody drinks water. It became somewhat famous during the last year in connection with the Ontario Temperance Act.

It is the principal town in the County of Haldimand; in fact it is the only town. There are several flourishing villages scattered about the county but Dunnville is the only regularly ordained town. It went through the ceremony of becoming incorporated as a town, and it supports a mayor and everything which goes along with a full fledged town. Up the noble Grand river about fifteen miles is a picturesque little hamlet by the name of Cayuga. Cayuga is the County seat and as such boasts the name of County town. The goal is in Cayuiga and the Poor House is in Dunnville. There being no poor people in Dunnville they have to draw on the Cayuga district for material to keep the Poor House in operation, and then in return Dunnville does the right thing by Cayuga in furnishing material for their institution.

I will get back to that keel in a little while but I can't get away from Dunnville just yet.

Away back in the early part of the last century when the Indians were camping in birch bark wigwams in such places as Chicago, Dunnville was a flourishing settlement. Some of the houses are still there. Dunnville got its start through the digging of the Welland Canal. In the early history of Upper Canada there were no railroads and in order to open up the country it was necessary to utilize the natural water ways with which the country was provided. This could only be accomplished by digging an occasional canal to get around an occasional cataract. One of the worst obstacles to navigation was the Niagara Falls. To get around this the Welland Canal was cut across the Niagara Peninsula. Business at that time was not sufficient to pay for blasting out the rock and constructing a canal such as the Welland Canal of today. A shallow channel was dug in the ground utilizing a natural stream part of the way and locks were constructed to raise the water eight feet above the level of Lake Erie, and a feeder was cut from the Grand River to supply the water. The Grand River flows into Lake Erie about fifteen miles west of Port Colborne, the Lake Erie end of the canal.

In order that the Grand River would supply the necessary water a dam had to be built to raise the level eight feet. The mouth of the river would be the logical place to build the dam, but in those days Canada was not on any too good terms with our neighbors and British war ships patrolled the lakes, and made good use of the mouth of this river.

The Admirality would not allow a dam to be built within five miles of the mouth of the river and accordingly five miles were paced off up the river and the dam built there. Above this dam the feeder was dug to connect the river with the canal. Many years ago the new Welland Canal was built with sufficient depth to allow the water to remain at Lake level, but the dam, the upper and lower river and the feeder with its numerous locks and bridges and wharfs still remain, silent souveniers of former activity. Little use is made of them now excepting a periodical overhauling at each approaching general election. This is Dunnville.

The five mile stretch between Dunnville and the mouth of the river is a veritable Paradise for boatmen. Dozens of brass-mounted racers can be seen there at any time during the summer season. At the mouth of the river is Port Maitland, frequently referred to as "Dunnville on the lake." This is a splendid harbor, used principally as a haven of refuge for vessels caught out in a storm. Pt. Maitland is a noted summer resort with pavilions and everything which goes to make a holiday outing what it should be. A long pier stretches out into the lake, with a lighthouse

on the outer end. Down the lake about three miles and about two miles from shore is an island with a beautiful sandy beach on the shore side, but with rugged rocky reefs projecting far out into the lake on the outer side. A monster stone lighthouse with a revolving light stands on this island. This island is the home of myriads of gulls and is nicknamed Gull Island, but its proper name is Mohawk Island and the light is known to sailors as Mohawk light. About twelve miles east of Mohawk island is Port Colborne, and twenty miles further east is Buffalo, N.Y. Now we have the lay of things and I will get back to the lead keel.

In the days of which I was about to speak there lived in the city of Buffalo a lawyer by the name of Bennett. He may be living there yet. He was a good sport and owned a sail boat known by the name of "West Wind". One bright breezy afternoon he was coming up the lake, but the breeze kept gaining in violence until he got abreast of Gull Island, when he decided to run in behind it for shelter. The wind however was too much for him and he was driven on the rocks and his boat damaged to such an extent that it could no longer be navigated without undergoing considerable repairs, so be being on an island and shipwrecked had to be taken in charge by the lighthouse keeper until he could be taken ashore.

Up the country a short distance from Pt. Maitland was a little hamlet called Stromness, which domiciled one, Archie McLean, a ship carpenter by trade, and a Scotsman by birth. Archie knew the boat business from A to Z having served a long apprenticeship in the old country. Archie was requisitioned to repair the damaged "West Wind" and on investigating the damages it was decided that while it was not badly damaged it would have to be put on the stocks and while it had to be fixed it might as well be fixed right.

Two tons of pig iron which served as balast was removed from the inside, and in place of this a lead keel of similar weight would be put on the bottom. I being the only foundryman in the neighborhood had the job wished on to me without advertising or in any way putting forth effort to get it. Two tons of lead was secured and sent up to my shop along with the pattern which was made in section but with lap-joints so that it could be built together on the boat. The front and back parts were massive pieces and the sides for the center board slot were separate and fitted into places left for them in the end parts. For the bolt holes it was decided to place bars of iron in the mold and pour the lead around them. These bars were afterwards driven out.

Instead of making the mold above ground and carrying the metal I simply leaded the patterns on the floor in front of the cupola and had the lead run from the spout through a boiler tube to the mold. I still maintain that I had the best possible method for pouring metal, as it travelled through this pipe and filled the mold, and this was all I wanted it to do. Where I made my mistake was in the melting.

In those days I had no knowledge of temperatures, or of oxidation of metals, So I fixed up the cupola in the ordinary way and charged on the lead as though it had been iron. I soon discovered that I did not need the blast so I turned it off, but not until after a lot of the lead had been burned up, and even after turning the blast, the heat was so terrific that all the lead was melted before the fire could be checked sufficiently to melt it right. I had the two tons of lead piled up in a heap on the charging platform where it would be handy to throw into the cupola, but before I had a tenth part of it in the furnace, a cloud of yellow smoke, thick enough to cut with a knife had filled the shop and as far as the eye could reach outside of the shop. I opened all the windows but it did no good as there was smoke outside as well as inside. It was lead smoke and of course heavy and it settled like German gas.

There was no escape from it, for with the molds partly filled I had to continue charging on until done. Some times I would hear a pig of lead hit the 'stack' and go 'thud' on the floor and I would know that I had missed my aim and would have to grope around and find it and try again. It did not take long to do all of it, but it took long enough to fill me up with lead, to an extent that I never intend to get over. I might say that when it was all melted I had only poured three of the four pieces, and their combined weight was six hundred pounds less than the four thousand pounds I had to start with. Mr. Bennett had to have another six hundred pounds of lead brought in before I could make the fourth piece. When I came to make it I was an expert on lead and I had no trouble with it.

I got the two tons of iron which came out of the boat and never presented any bill. Mr. Bennett was a good many dollars out of pocket by the deal and so was I but I had a lot of experience.

Considering the fact that I was young and that I had no one to advise me I still think that outside of my one mistake in having too hot a fire I had about as good a method as any for doing such a job. Lead runs like water through a pipe and would even have run just as well if I had nailed two boards together like a pig trough, and black washed them in a manner similar to that adopted by Mr. Allare in coating his wooden cores. Where I was the loser was in breathing the poisonous fumes. I don't think I ever got really over the effects, but I was several weeks getting into a condition to hold anything on my stomach or take a full length breath. I had a doctor working on me for quite a while. I took emetics etc., to rid myself of the poison. However the keel was a success and "West Wind" won many races carrying it.

THUGS ROUNDED UP

To wish anyone to be executed would seem to be a savage wish, but there are times when we are forced to take sides with the executioner from the standpoint of safety. Friends of Wilfrid Sly and his business partner George Tanner who were fouly murdered a few months ago will be gratified to know that the gang which was responsible for their murder has been rounded up. Two have been sentenced to death and the others who were not easily captured are now in custody.

Wilfrid C. Sly and George K. Tanner who were the managing directors of the W. W. Sly Mfg. Co., Ohio, went one day in January last, to the bank in an automobile and secured the money with which to pay their men, amounting to some thousands of dollars. On their return they were met on a bridge by another auto which blocked the way and prevented them from proceeding. Mr. Sly stepped out to get the number of the other car, with a view to lodging a complaint, when he was shot dead. Seeing what was up, Mr. Tanner seized the grip containing the money and proceeded to escape with it when he too was shot down. In the excitement the bandits jumped into another car which was in readiness and escaped.

It took a lot of detective work to find out who the guilty parties were and then a lot more to apprehend them, but to the credit of the Cleveland detective force they are now safely in the toils of the law. The real culprit was a boy of seventeen years by the name of Sam Purpera who was arrested in Los Angeles. Frank Hotto and Louis Komer were caught soon after. While there remained at large two more of the gang Banigno and Colletti who while not having done the active shooting were older and presumed to be the instigators of the crime. These escaped to Mexico but by the persistent labor of detectives Matowitz and Cavola of Cleveland, they were brought back to the United States in the face of opposition from the police and government of Mexico.

Gangs of this description are a decided menace to a civilized people, and since they have nothing to their credit, it should matter but little, which one fired the fatal shot. The placing of the weapon in the hands of a half grown boy is just one of the well planned features of a desperate scheme. If captured, his extreme youth would create sympathy while the older members of the gang could prove that they had not committed the murder. No community is safe where that class of individual is allowed to dwell.

New Foundry in Belleville

National Castings Limited, is the name of a $50,000.00 corporation which has recently started operations at Bellville, Ont. The installations are not quite completed but are being hurried along, although several heats have been taken off already in order to fill some contracts which were waiting. The two units of equipment which are now being installed are a tumbling mill and a tilting brass furnace. The leading men in the enterprise are N. L. Turner, President and F. A. Daniels, Manager. Mr. Daniels is a practical all-round foundryman while Mr. Turner is an expert electric furnace man having done expert work for the Government during the war. It is the intention, as soon as times liven up a little bit, to install an electric furnace and specialize in electric steel castings. It is also the intention to install a number of molding machines.

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Canada's Foundries

A FEW WEEKS ago we took a business trip through the States of Michigan, Indiana, Illinois, Wisconsin and Iowa, and had some particularly interesting conversations with our cousins in that territory, and while we admire the Americans and are prepared to give them a place in the first row in regard to greatness, we are constrained to inform them that they have yet a few things to learn, and one of these is the story of Canada's foundries. When we speak of a business trip we, of course, mean foundry business, nothing else; and it is astonishing the lack of knowledge in this direction on the part of the average American. They know we have a population of approximately eight millions, and that we have several cities of considerably more than half a million each, yet they seem to have allowed themselves to be led astray with the idea that we are a nation of farmers, and that beyond our hard wheat we have little else to our credit. While we have to acknowledge surprise at their lack of information regarding our metal working industries, we have to admit that the majority of our own eight million are in the same boat and that while the Americans are, in a way, excusable, there is no excuse for our own race. For the enlightenment of everyone who is in any way interested in such matters we purpose, in our next issue to illustrate some of our Canadian foundries and see how they compare with those of other lands.

Some figures regarding foundries in proportion to population will be of interest. Great Britain and Ireland, with a combined population of 50,000,000 have, to be exact, 2,796 iron foundries, divided as follows: England, 2,355; Scotland, 305; Wales, 84; Ireland, 52. This makes an average of about one iron foundry to every 17,000 of population. In addition to this, there are, in all probability, some brass foundries, which are separate from the iron industry, but this is not a big enough proposition in any country to make much difference in the proportion.

In the United States, with a population of 110,000,000, there are 6,500 foundries which include iron, steel, and nonferrous metals. This will also figure out to about 17,000 of a population for each foundry.

Now, what have we in Canada? We have a population of about 8,000,000, and we have over six hundred foundries, but then we cannot prove this, and perhaps some of our readers will doubt it, so we will take the list compiled by our American contemporary which allows us about five hundred. Divide eight millions by five hundred and we have sixteen thousand. Figures can generally be depended on, and by figuring the statistics taken from the other countries and not from our own, we find that we have a foundry for every sixteen thousand of population, while they have a foundry for every seventeen thousand. Now it might seem proper to say that ours are little shops. But what kind of foundries have we and what have they?

We know that the other countries have some big plants, but we also know that in their list of foundries they have some which employ one molder; some with half a dozen, and so on up. In Canada we have some small ones, but we have some that are not so small, and just to open the eyes of those who do not know these things, we will show some of them in our October issue.

Business Outlook

IT IS useless to look too optimistically upon the prospects for the coming winter when everyone knows that conditions are not satisfactory and the outlook not bright, but in the face of this there is a strong undercurrent or feeling among business men that an improvement is already being felt. Inquiries are coming in better and once the public can come to the conclusion that the prospects of a big drop in prices is not likely to materialize money will begin to circulate and times will gradually improve. The demand for the ordinary run of goods should be as great as ever but no one likes to make a purchase and then learn a few weeks later that he could have saved money by waiting. The amount he could have saved by waiting must also be taken into consideration because doing without what is really needed is a loss which might more than offset the gain in waiting. One drawback to the present year is the partial failure of the farm crops but this is nothing like some pessimists would paint it. A farmer seldom has a good crop if it is left to him to tell it, and the only ones we hear from are those who have had a poor one. As a matter of fact there are some sections where the oats and hay have been what might truthfully be termed perfect failures but throughout Ontario and eastern Canada the crops will average about sixty per cent normal while in Manitoba, Saskatchewan, and Alberta the crops are the best since 1915, being far superior to the Government estimate. It is not the crops that are the drawback so much as the price. The farmer is selling his produce too cheaply when compared with the price of other commodities, and if the public could get the benefit of these low prices it would soon bring things to a normal state. There is a mystery which no one seems to try very hard to solve. Who gets the difference between the four cents per pound which the farmer gets for his cattle and the thirty-five cents per pound which the dealer gets for beef steak? The price of hides and wool at the present time do not compare very favorably

with the price of shoes and clothing. The working man's wages get blamed for a lot of it, but we know about how much the working man gets out of making a pair of shoes or tanning the leather from which they are made. There are profiteering middlemen who are harvesting far in excess of their dues and if this kind of thing can be discouraged it will go a long way to ease the tension which is strangling legitimate business.

Are They Wise or Otherwise?

IS THE MAN, who has means at his disposal, doing the right thing by himself in holding onto it until someone else makes a move? Or would he be showing better judgment if he would loosen up and get the wheels of industry moving? It only takes a few to get things started and if an article is bought at a price in excess of what it is really worth and of what it might bring in the near future, the good which the transaction does to business might easily outweigh the difference by stimulating business in general.

The Molder and the Molding Machine

IN THE July issue we published a few letters on molding machines and their adaptability to the modern foundry, and in doing so we did everything possible to point out that the regular jobbing molder would not be affected, but it was of no avail. We visited a foundry a short time afterwards and got a terrible reception from one of the molders who happened to see these articles. His argument was the same old story about driving the man to the wall and putting machines in his place. It seems as though this view will prevail, no matter what proof to the contrary is brought to bear. It is not long since the agricultural implement foundries were operated entirely by hand, and goodness knows that no more slavish line of work could be chosen. Lifting and lugging, ramming and shovelling constituted the entire day's program. The machine now does the drudgery while the man is pulling levers and opening valves. The principal worry which the men have is that the production is so greatly increased that it cannot do otherwise than make less demand for even the men who operate the machines. They cannot see that the greater production with its lower cost increases the demand, or in other words the lower cost of castings allows of their use in places where something else would be substituted if hand made castings had to be depended on. However the molding machine will take its place in the foundry the same as machines have taken the place of hand drudgery in every other line. All work was done by hand at one time but how would it take these times. How many carpenters or handy men or even common laborers would tackle a rough lumber pile with hand saw and jack plane and undertake to build a house? Yet woodworking machinery met with opposition when introduced. Not many years ago the broad axe and the adze were in common use. Who would wield them today? How many men would respond to the call of the farmer to follow a reaping machine and bind the sheaves of grain by hand as was done a very short time ago? Not many. The same condition is rapidly coming about in the foundry, and in another decade the foundryman who tries to operate without machines will not be able to get men to work for him. Molders will smile at this, but ten years from now they will wonder how they ever postponed it so long. There is no reason why molding should lag behind any more than any other occupation.
Business Outlook

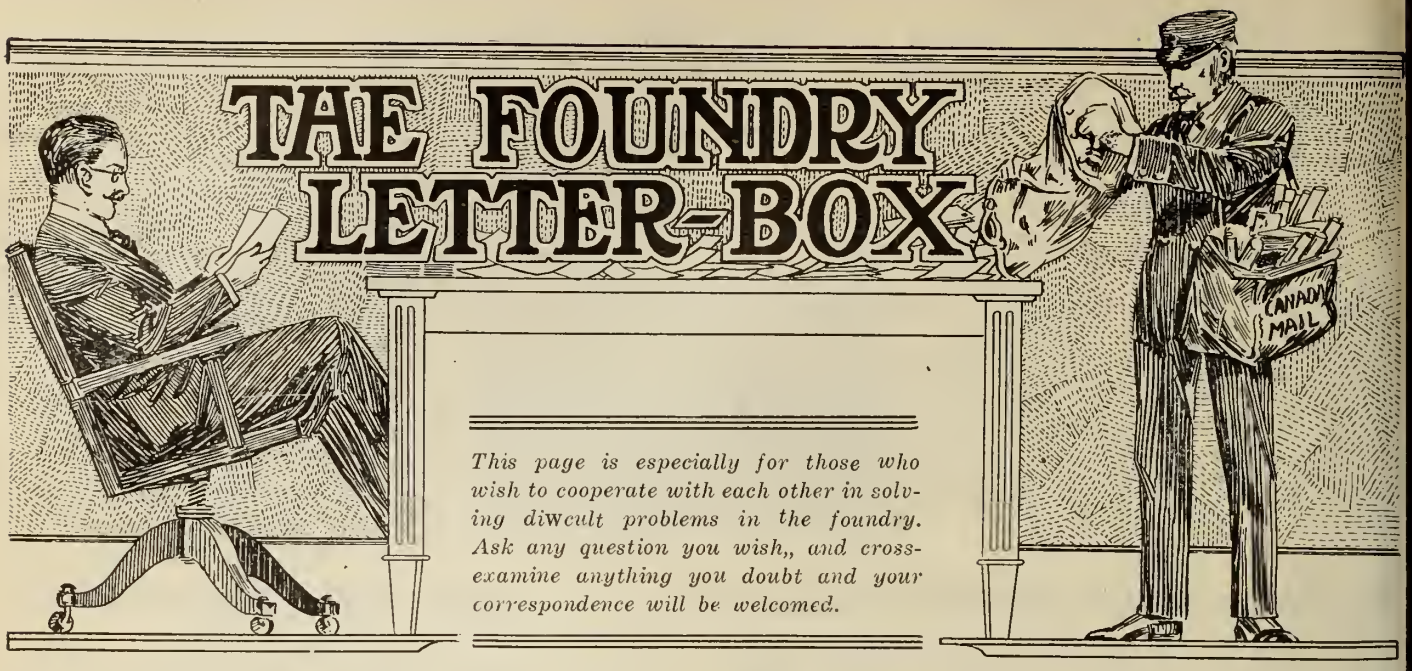
Saving Worn Machinery

A BRITISH engineer has developed a method of depositing nickel on the worn parts of machinery. This, of course, means the saving of many machines which would otherwise be useless. It is already well known that welding has been used to build up engine crank shafts after they have reached a worn condition, the process being to weld fresh iron or steel on to the worn parts, and the whole then made true in a lathe. There are objections to this process in certain cases, and in order to overcome these objections, the new process has been evolved. Following is the method employed:—The piece of machinery to be treated is first made free from grease and dipped bodily in a bath of molten wax. After the wax has cooled it is removed from the parts which have to be restored and is left on the others as a protective covering. Cleaning in a bath of acid is followed by immersion in an electro-plating bath which deposits nickel on the exposed surfaces. The coating of nickel is extremely hard, and when the process is properly carried out the nickel adheres with remarkable tenacity to the metal on which it has been deposited. Crank shafts, spindles, axles, pistons and similar objects can be made quite serviceable again by the nickel layer at a cost below that of replacing the whole part. Deposits up to one-eighth of an inch can be applied successfully. It is expected that this process will be developed alongside the welding processes which have been brought to so high a pitch of usefulness in many repairs, such as the mending of cracked or broken castings, which could not be handled by the deposition of nickel.

Signs of a Revival

THE news from the various freight markets of the world show that there is at last some signs of that revival in the shipping trade, that has been earnestly looked for. This follows the resumption of work by the coal miners in Great Britain, and the progress of the price of this fundamental necessity to industry to more reasonable levels. Shipowners are once more enabled to send their vessels on long voyages in ballast, to bring return cargoes home, without the whole revenue of the voyage being eaten up in fuel costs. However, the price of coal has not yet reached the level where it can be exported to any great extent, and the fact that European countries have on hand large stocks of American coal that were shipped during the strike also militates against export of British coal for the time being. This will adjust itself in time, and there is little fear of American competition in this trade once conditions are normal. Another faint hope arises, in contemplating the appalling condition of Russia, that the powers there will be at last convinced that their effort towards a Communistic state has proved abortive, and that agriculture and industry may once more be resumed in that tortured land.

TRY ANOTHER KEY.



This page is especially for those who wish to cooperate with each other in solving difficult problems in the foundry. Ask any question you wish,, and cross-examine anything you doubt and your correspondence will be welcomed.

WITH this issue we are introducing a mail-box section and are looking forward to seeing it well patronized by our readers, and for that matter by anyone who is interested in any of the lines on which we treat. We have always encouraged the questions and answers feature, and while our mail-box section will include this, we do not want this to be its only usefulness. We want our friends to write to us and comment on articles which have appeared, and suggest something on the subject, etc., and while we have no enemies there may be those who do not think the same as we do, or as some of our contributors do, and we welcome their views with the same heartiness as we do the others. During the last few months we have received some very flattering comments on our efforts to interest those who enjoy reading foundry literature, and while we are not developing swelled head or anything of that kind we have to acknowledge that we appreciate these compliments and will always have in view the fact that there is room for improvement, and whenever an improvement looms up we will endeavor to make use of it.

One thing which we want to bring home to our readers is that we take no stand on the run of subjects which have what might be called two sides to them, such as Capital and Labor. We know that the employers and the employees in all lines have organizations and that they have publications which act as organs for said organizations, but while we respect them all, we do not consider them as any opposition to Canadian Foundryman.

We know that in the United States there are a number of foundrymen banded together who publish a paper called the "Open Shop Review." And we know there are a number of molders banded together who publish a paper called the "Molders' Journal." Both of these publications come to our desk and we never see anything in either of them which we could call objectionable, but at the same time we can not help but see that they are both "jug-handle" —all one-sided. We take all of this good naturedly and let it go at that. We don't blame anybody for joining any organization he feels disposed to join—that's his business, not ours; but we do blame the man who is too one-sided to read anything excepting what is along lines which he has always followed. If a man intends to be a success in life he should not consider others as his enemies because they do not agree with him, but if there is any particular set which he has decided are his enemies he would be in a better shape to combat them if he would keep himself posted on their views.

However, our pages are open for your views, whether you are the apprentice or the proprietor, providing they are written in such language as does not require dashes to replace some of the words which have to be left out. If your mind is in such a state that some of the words have to be omitted in order to cover the law, we would rather that you would wait until next day before submitting the article. However, we will always be glad to hear from any one who is interested in foundry work and we will do what we can to keep him interested in Canadian Foundryman.

HAS IT IN FOR THE PATTERN-MAKER, BUT IS STAUNCH FOR THE MOLDER

Editor, Canadian Foundryman:

Regarding your article in May issue entitled, "Sounds All Right," allow me to thank you for your timely article. Your statement that in large plants it is deemed necessary for some fellows to come from somewhere other than the foundry in order to keep an eye on the foundry foreman is true. I can name several large foundries which have pattern makers for superintendents. Did you ever hear of a practical molder as superintendent of a pattern shop? I admit that to learn pattern making an apprentice requires a better education to commence with, but if one serves faithfully and becomes expert in his trade the positions become reversed, because a journeyman molder will then have a better education along trade lines than a pattern maker. When a pattern maker becomes expert in his line he is rated fit to run a pattern shop, and incidentally the foundry, (presuming, of course, that foremen are made, not born). The molder who may start with equal or even less education must learn core making in addition to a general knowledge of the various branches of molding. In addition to this he should also know a little of atmospheric conditions, how they affect sand and cupola practice. He should also understand mixing by chemical analysis and have a good, all-around knowledge of variations pertaining to his craft.

As the editor of "Foundry" (June 15 issue, page 494), says: "In nearly all branches of the mechanical arts, the craftsman can watch the progress of his work, supply any deficiencies, and assure himself in various ways (by checking up) that when finished, the job will be satisfactory. The only test the molder has is the final test of pouring. There is no adding to or taking from. The casting IS or IS NOT, and when we realize how many different things cause scrap castings, we are sore at the theorists for their lack of appreciation of our difficulties. In addition, if a molder gets charge of a foundry he should have a practical knowledge of the cupola. In my own experience I recall one particular instance which shows this. I had taken charge of a foundry in a small town in Ohio. The first morning I was on the job the cupola man hit me for a raise. I tried to have him wait a few days until I got my bearings, but

e said "No." "No raise that day, no eat that day." I did not want to have ny words with the men in the shop the rst day I was there, but this was too uch, and while I wanted to treat him airly, there was nothing for me to do ut to tell him that he had better go to he office and get his money, and we ould run the heat off all right. He aid he would like to know how, as no ne in town, excepting himself, could un a cupola. I said: "Go on, get your oney, I'll run the cupola."

I had to don overalls, daub up the rickwork, put in the bottom, light and harge the cupola, also do the tapping ut. What pattern maker would have one this?

Incidentally I had to teach a new man ow to run the cupola, and curious to ay, the previous man came back three eeks later at reduced wages as the elper on the platform.

I often wonder why pattern makers re put over foundries. In some places here I have been molders should have een put over the wood butchers who urned out the patterns without draw- ng straps or drawplates, some back- rafted and some with no draft at all. s long as a pattern is smooth and has nice coat of paint or varnish, the tech- ical man thinks it must be all O. K.

I could write a book about patterns I ave used, but my quarrel is not with he pattern makers. The truth is, the etish of the white collar is the kernel f the whole thing.

The art of economical foundry pro- luction needs more brains than any other department in the plant, and hould receive its dues in the way of recognition and encouragement. Now, Mr. Editor, I would like you to publish this letter and see if we can't "Wake 'Em Up!"

WANTS BOOK ON CUPOLA TROUBLES

Editor, Canadian Foundryman:—

We understand that you publish a treatise on foundry practice, and if so, we shall be glad to have you advise us, together with price.

What we are looking for is a handy reference book that will clear a fellow up on actual foundry practice when he runs into troubles, and one that is not written from theory, but will produce results, from experience.

For instance, supposing one has been getting a two-ton melt in an hour, out of a 30 inch inside diameter cupola, with no trouble from either cold iron or slag, then when he endeavors to increase it to three tons, he has trouble from both cold iron and slag? Could he immediately refer to such a book and have it tell him what to do to overcome his troubles

Furthermore, when he finds he over- comes his cold iron and slag, he can't keep his firebrick in, but burns them out about twice a week. Can he look up this book and be told what's the matter?

Another time he may be having cold shots in a furnace radiator. Will this book tell him that he is trying to pour his iron too thin in certain spots, and to fix his pattern or shave his mould, or will it tell him to use ferro-manganese, and thus avoid the cold shots?

Subscriber

..Answer:—We do not publish any book on foundry practice excepting "Canadian Foundryman." This we consider all that is required. We are always at your disposal and will do everything in human power to get you the correct remedy when you are in trouble. The troubles which you are having are inexcusable. If your cupola is not of modern design it should be remodelled at once. The last two issues of "Canadian Foundryman" had some articles on the subject which were favorably commented on by our readers. If the tuyeres,wind pipes, blower, etc. are as they should be the melting is a simple process. This also is published frequently in this publication. In the next issue we will publish what the American Foundry Equipment Mfrs. Assn. say on the subject.

INFORMATION ON ELECTRIC FURNACE

In our last issue we published a question relative to melting by electricity to which we have received answers from prominent Canadian and American authorities. The following two letters which are practically the same, although coming from widely different sources should be a sufficient guide to prospective buyers.

Editor, Canadian Foundryman:—

In your July issue a subscriber asks for information relative to the use of electric furnace, particularly with reference to grey iron melting. Under ordinary circumstances where material required for cupola operations is reasonable in cost the cupola method is somewhat cheaper than electric furnace melting. If, however, power can be obtained at a low rate, or cast iron borings are available at low price, the electric furnace will undoubtedly compete even with the cupola furnace.

I would suggest that your customer send us details as to his costs and we will then be glad to advise whether the electric furnace is suitable for his particular proposition.

A 1½ to 2 ton capacity furnace would melt iron, steel or grey iron, but we should not recommend the same type of electric furnace for brass melting. The approximate installed cost of a 2-ton furnace would be aorund $24,000.

Editor, Canadian Foundryman:

We note, in the July issue of "Canadian Foundryman" that a subscriber desires certain information relative to the cost, success, etc., of the electric furnace as a medium for melting grey iron, and the cost of production as compared with the cupola.

In the article, referred to, no mention is made as to the cost of coke, or the cost of making grey iron, in your subscribers particular locality, nor is any mention made as to what the power would cost to operate an electric furnace. Without having some more definite information of this kind, as you will readily appreciate, it is very difficult for anyone to make an intelligent comparison of costs. If your subscriber will therefore advise us as to what the power Company would charge him for power, and at the same time advise us the primary voltage and cycles of the power that would be available, we will be very pleased to give him the approximate cost of making grey iron with the electric furnace, as well as the cost of installation.

Regarding the type of electric furnace that could be installed, any of our standard steel furnaces can be used for making grey iron and these are made in standard sizes of ½, 1, 2, 3, 6, 10 and 15 tons capacity. Any of our standard steel furnaces can be used in making grey iron as well but this design of furnace is not the most efficient furnace for melting brass. We, however, manufacture an electric furnace specially for melting brass.

OXY-ACETYLENE

A subscriber writes, asking for information re cutting by the oxy-acetylene process and in his letter he states that as fast as the metal is cut away the space behind the jet fills up with the melted metal which was just cut out and he wishes to know the remedy. He does not give the thickness of metal being cut nor say what metal he is cutting, so it would be a difficult matter to give the exact information in a few words.

Since this a matter which is of interest to every one who does this class of work, it will no doubt be the proper thing to describe the process so that it will be possible to cut any thickness of either steel or iron. It must be remembered that cutting is entirely different from welding for the reason that the carbon contained in the metal is utilized as fuel, and for this reason the process is only adaptable to metals containing carbon.

Carbon and oxygen are the two materials which combine and permit of combustion in an ordinary fire and as soon as the oxy-acetylene flame has sufficiently heated the iron or steel to permit the carbon to unite with the oxygen the acetylene is turned off.

Other things to be remembered are that the proper pressure must be maintained on each gas container and that a proper sized tip must be used. Very little experimenting should be necessary to arrive at the proper proportioning of the gasses to make the most effective flame.

The following table, compiled by the Davis-Bournonville Company will be a valuable guide in selecting the proper tip, and the proper pressure to have on each container, according to the thickness of metal given in the second column

DAVIS-BOURNONVILLE STYLE C CUTTING TORCHES WITH STYLE 12 TIPS

Tip No.	Thickness of metal Ins.	Acetylene pressure lbs.	Oxygen Pressure Ins.
1	1/8	3	10
1	3-16	3	15
1	1/8	3	20
1	5-16	3	20
2	1/4	3	10
2	"	3	20
2	3/4	3	30
2	1	3	35
3	1	4	30
3	1 1/2	4	40
3	2	4	50
3	3	4	60
4	3	5	60
4	4	5	70
4	5	5	85
4	6	5	100
5	6	6	90
5	7	6	100
5	8	6	125
5	10	8	150

"Hourly Consumption" is the maximum with torch burning continuously at the pressure given. Maximum hourly consumption is rarely obtained with either welding or cutting torch in practical work. These figures are principally useful in estimating costs of gas on actual welding and cutting time.

The work requires a cutting torch and cannot be done successfully with the welding torch.

The process consists of heating a spot of the metal to be cut to a red heat and projecting upon it a jet of pure oxygen which causes the metal to burn away, a stream of oxide running out of the kerf thus produced.

The torch is advanced at a rate dependent upon the thickness and nature of the metal and the presure and volume of oxygen being used.

The cutting equipment is set at the pressure necessary to produce the required cut. This may be taken from the table given.

After lighting the acetylene, the oxygen is turned on by means of the bypass needle value on the side of the handle, until a correct flame is obtained. It will be necessary to adjust the flame with cutting trigger valve open to get correct results.

Tips for different purposes have from one to five flames; the tip with two heating flames and one cutting jet is used for most classes of work. These are played upon the metal until it is seen to glow all over. The trigger on the underside of the handle is then pulled with the first finger, allowing a stream of oxygen to impinge on the hot spot, which starts the cut and when it is desired to stop, the trigger is pushed in the opposite direction by the back of the second finger.

The torch is traversed along at a uniform rate about the same as that necessary to saw by hand equal thickness of hard wood. The torch must be kept moving or the flow of slag stops, thus stopping the cut.

The principal factor in successful cutting is to properly support the body and torch to as great an extent as possible commensurate with the forward movement of the torch. The position must be an easy one, as muscles under tension will cause vibrations and these are fatal to good cutting. This is one condition in which "lounging" is allowable, and an actual benefit.

Oxygen pressure should be kept as low as possible and the most economical cut is one in which the striations formed on the surface of the cut show a considerable lag. This, however, affects somewhat the smoothness of the cut. Extreme smoothness is more dependent upon a uniform correct traverse in accordance with the size of the tip and pressure being used. Too fast and too slow traverse will both produce a rough cut.

When the torch is held in a machine very smooth, accurate results are produced, comparable with roughing machine tools.

Numerous special tips are available for special purposes, including bent tips to trim off flanges close to the web of structural shapes and to cut off rivet and bolt heads, and for cutting inside of boiler tubes.

HAS TROUBLE WITH PISTON SHRINKING

Editor, Canadian Foundryman:

We are having trouble in casting automobile pistons and would be glad to have your advice as to gating, analysis of metal, etc.

The castings are made from loose patterns and were gated according to the enclosed sketch.

The basin at "A" was omitted at times without making any appreciable difference. The metal analyses as follows:

Silicon	2.30
Sulphur	.054
Phosphor	.481
Manganese	.56

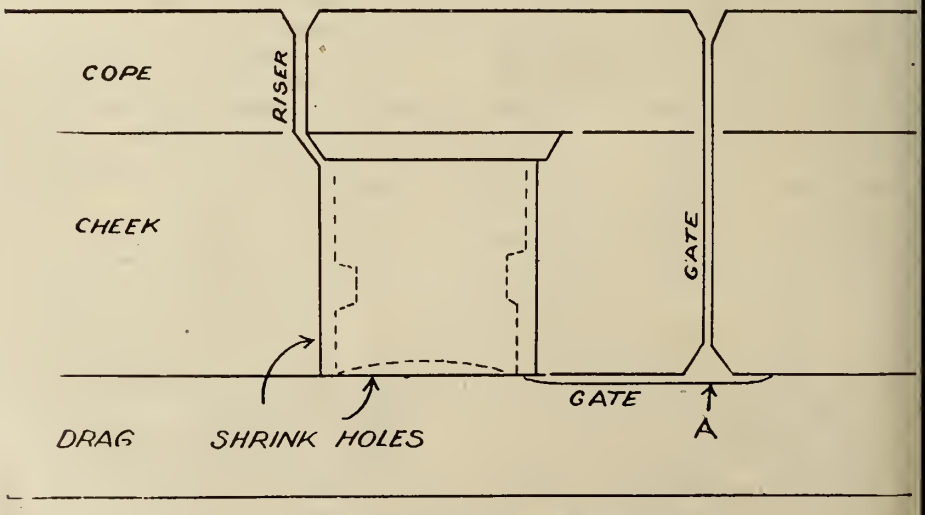
We have been able to obtain castings free from dirt and blow holes but have had a great deal of trouble with shrink holes at the points shown on the sketch.

We have tried adding one-quarter of one per cent. 80-per cent. Ferro-Manganese, but without satisfactory results.

Any information you can give us regarding these castings will be appreciated.

Manager Iron Foundry.

Answer—I am of the opinion that the bottom is heavier than you illustrate it. This added to the fact that the section where you show the shrink is heavier than the portion above it makes a casting which will cool from the top down. When these heavy parts solidify there is nothing for them to do but shrink in the manner they are doing. Iron castings always contract in cooling, but this is allowed for in the pattern. Contraction and shrinkage are two different characteristics. If a casting can be kept supplied with molten metal while it is contracting it will be sound, although smaller than the pattern. If this cannot be done it will have shrunken spots along with the contraction, for the reason that when any casting of even proportions is in a molten state its own weight will keep it sound by simply settling down. In the case of a casting with the upper part lighter than the lower this cannot take place, as the top part is set and the lower part having nothing to draw from, is forced to bleed itself, even before it is congealed. To overcome this trouble it is necessary to have a non-shrinking iron or else provide some means of making good this loss. Your metal would appear to be ideal for pistons, but 2.75 silicon would shrink less, although making a less dense casting. Pistons should be made the other side up, but you could accomplish something by having the gate cut above the parting instead of below it and then have the chamber "A" cut over as near the casting as possible, and have it heavy enough to remain fluid until after the casting is set.—Editor.



Sketch of piston which caused trouble.

Scraps *from* The Foundry Scrap Pile

Toronto Brass Foundry Destroyed by Fire.—The brass foundry of The W. C. Hunt Co., 30 Holley St., Toronto, was destroyed by fire between one and two o'clock Tuesday morning, Sept. 6th, entailing a loss of between $25,000 and $30,000. The cause of the fire is unknown. The company manufactured a line of brass fixtures for lighting purposes, etc., and were fairly busy. They will rebuild promptly.

* * *

Springer Lock Co. Building Addition—The Springer Lock Co., Manufacturers of locks and builders hardware are erecting an addition to their machine shop. The addition which is in the form of an extension to their present machine shop is 47x89 feet and two stories high. When completed the entire machine shop equipment will be on the lower floor, while the second story will be devoted to packing and storing goods. The building will be of concrete, faced with brick. A powerful automatic "Bliss" press is being installed. With the increased machine shop capacity the output will be greater and will of necessity create a greater demand. For the present no extensions to the foundry buildings are contemplated.

* * *

Machinery and Foundries, a new institution just opened for business in Brockville, Ont. a few months ago, report that business is picking up in a satisfactory manner. They manufacture pumps and general hardware. Of course their equipment is all new and their work shows it. The semi-rotary pump has to be finished to the thousandth of an inch, and these pumps are in big demand. Their foundry is already equipped with four molding machines which will be increased as business demands. In order to do the class of work mentioned they are driven to use the finest grade of iron and they report that while they are not complaining about the amount of business coming their way, they are prepared to fill orders for castings calling for this grade of metal.

* * *

The Triumph Electric Company, of Cincinnati, Ohio, for nearly thirty years manufacturers of 40° Triumph Polyphase Induction and Direct Current Motors have again been forced to move their Philadelphia Office to larger and more spacious quarters to adequately take care of the increasing demands of their business in the section. The new quarters are at 709 Arch St., Bell Phone Market 0196, Keystone Phone Main 1800. This territory is under the direction of District Manager Arthur H. Allen.

* * *

The English Electric Company of Canada, a subsidary Company of Great Britain which is reputed to be the largest manufacturer of electric and allied machinery and equipment in the British Empire have acquired the plant and good will of the Canadian Crocker-Wheeler Company of St. Catharines together with all the patents and designs of this company. They also hold the exclusive manufacturing rights for all the patents, designs, processes, etc., of the English Company. Gordon F. Perry, President of the National Iron Corporation, Toronto is chairman of the board of directors.

* * *

PAX-ON-WARD the monthly magazine of J. W. Paxon Co., Philadelphia, is to hand and is an interesting sheet. Naturely it treats in the main on the subject of plumbago, core compound, cupolas, shovels and the thousand and one other incidentals which make up the equipment of a foundry. But in addition to this it contains much valuable information on the trend of the times, salesmanship, and various other topics of every day interest to foundrymen and others. It is also interspersed with innocent jokes and is an all round interesting paper.

* * *

The Hammer Core Machine is the title of a fairly large catalogue which is being given out by The American Foundry Equipment Co., New York. The contents which are profusely illustrated, show the Hammer Core machine in all the styles and sizes furnished by the Company, giving details, along with an interesting story of the development of the machine, from its inception. Other machines described are cutting off and tapering machine, steel cabinet on which Core machine is placed, the interior of which holds the motor and gearing where it will be free from dust and dirt. The remaining space holds the fittings and trays. Considerable valuable information is given regarding core work.

"You are only punishing yourself by holding off" is the verdict of the K.C.B. Co. of 495-497 North 3rd St., Philadelphia, Pa., in a pamphlet which they are distributing relative to their Magnetic Equipment. One type of separator on which they specialize and which is discribed very thoroughly is a hand operated magnet which may be connected to a lamp socket. The device is made for use in foundries, machine shops, enamling, trimming, and electro plating plants, as well as many other places where iron chips will be injurious. The standard magnet is designed for use on 110 volt direct current while special magnets will be furnished for 220 volt direct current. Where only alternating current is available it is necessary to convert it to direct current. For this purpose a specially designed motor generator set is furnished.

* * *

SANDCRAFT is the title of a neat pamphlet which is being distributed by J. M. Betton, New York City. The contents of the pamphlet gives a complete discription of an injector sand blast apparatus manufactured by the above company. The injector sand blast apparatus is an application of the injector principal, as commonly applied to steam injectors, to the sand blast, the highest possible velocity necessary being imparted to the mixture of compressed air and sand by the several air jets, by means of which the quantity of air can be controlled and directed, this being an essential feature. With this type of sand blast, castings can be cleaned, scale and rust removed from steel structural work, dirt and weather stains from the stone and brick work of buildings and other similar work, with the minimum amount of air, sand and pressure. Drawings and other information such as tables of pressure, etc., are included in the contents of the pamphlet.

* * *

SHOPS NOT ALL SLACK

By F. H. B.

The small foundry is perhaps dying a natural death, but I have always contended that there is still an opening for the small foundry, and that it can be profitably operated. A few days ago I happened to be in the town of Port Hope and called at a very small foundry operated by Thomas Hayden and son. They had a good cupola in the foundry, while their machine shop consisted of an emery wheel machine and

a drill. Their main line of goods manufactured, consited of plow shares, which they ground and polished. Two men and an office girl seemed to constitute the staff, but they were just as busy as they could be and were doing well financially. They were in a financial position to increase their plant, but did not feel so inclined. Why encumber themselves with additional worry when they have a good thing as it is? I still insist that the small shop can survive if in the hands of capable men. Every town, no matter how small should support at least one foundry and this foundry should be equipped with tools and machines for properly doing whatever line of work is to be had. It is not the right idea to install expensive machines which will be idle most of the time but this is simply bad management to have anything idle in a small shop. A small foundry properly managed is a good investment.

* * *

New Foundry and Pattern Works at Lindsay.—Lindsay Foundry and Pattern Works, Limited, is the name of a new organization, which has been incorporated at Lindsay to carry on the business of general founders and pattern makers. The old, well known, Sylvester Harvester works at Lindsay was, at one time one of Canada's leading industries, but some years ago the foundry was dismantled, and during the war the buildings were utilized as munition works. During the last few years the machine shop has been in operation doing a line of gasoline engine work, but the castings had to be bought outside. The new company has built a foundry in connection with this plant and are prepared to do skelton pattern and sweep work as well as any class of special machinery and jobbing work. The directors of the company are, V. Swenson, President; K. B. Sylvester, Vice President; E. Crossley, Secretary Treasurer; Albert Anderson and F. Byrd.

* * *

WHAT KIND OF PATTERN MAKERS DO THEY HAVE OVER THERE ANYHOW?

WILMINGTON, Del., Aug. 1.—Evidences of incendiarism are elleged to have been discovered at the scene of a fire which destroyed the pattern making shop of the American Manganese Steel Company at Newcastle today. A night watchman at the plant told Fire Board authorities that he saw six negroes running from the pattern plant a few minutes before it burst into flames.

It will be eighteen months before some of the patterns stored in the structure can be replaced. The loss is estimated at more than $170,000.

PHILADELPHIA, Aug. 13.—What is believed to have been an attempt by incendiaries to destroy the headquarters of the Pattern Makers' Union here was discovered by a night watchman today.

Frank Harris, the watchman, found several juarts of gasoline and strips of cloth soaked in the same fluid scattered about the floor of one of the union rooms. A fire had started but it died out after doing damage estimated at $100.

* * *

PURSUIT

Why are we so optimistic regarding the revival of business? Don't we see the masses of unemployed lying around in Public Parks awaiting the signal to commence pursuit of the opportunities which accrue from prosperous times? Yes:—but we see more than that..... we have been laboring under a most intensive strain, and with the relaxation during the past six months the captain of industry is out taking lessons in Business Economics which sandwiched with a little more pursuit of pleasure is bound to give him renewed physical strength, and with it a new viewpoint as to the best method of the conduct of modernized production in the co-operative spirit of remuneration, which will conquer and satisfy the jealous cravings of our suspicous natures.

This re-organization will be a slow process, but it will be achieved, Mr. Purchasing Agent, and you are solicited to help now by deciding to give preference in purchases based on absolute determined quality, and not on price only.

Will you advocate it with your associates?—Paxson.

* * *

RADKEY SANITARY ACID-RESISTING BRONZE

Mr. John Radkey, foreman of the non-ferrow metal department of the National Manufacturing Company, Brockville, Ont., has, after persistent labor, perfected another bronze which has proved to be of inestimable value in the dairy. The company manufacture a line of milking machines and milk pails, and any casting with which the milk comes in contact must be of such a composition as will not corrode or contaminate the milk. The formula which has been decided upon as coming the nearest to perfection for the purpose consists of 27 per cent. nickel and 73 per cent copper. Nickel, melting at a temperature considerably in excess of that required to melt iron, should be melted first, after which the copper is introduced. After both are melted and well mixed a small quantity of aluminum, say a quarter of a pound to one hundred pounds of the alloy is added. After stirring this through and skimming off the dross which comes to the surface, the metal is ready to be poured. Castings made from this metal are fairly hard and tough, have a beautiful color, somewhat resembling German Silver, and take a good polish, and as already pointed out are not affected by the action of the milk.

THE SALEMAN'S CREED

I believe in the goods I am selling; in the firm I am working for, and in my ability to get "results."

I believe that honest goods can be sold to honest men by honest methods.

I believe in working, not waiting; in laughing, not weeping; in boosting, not knocking, and in the pleasure of selling goods.

I believe that a man gets what he goes after; that one order today is worth two orders tomorrow, and that no man is down-and-out until he has lost faith in himself.

I believe in today and the work I am doing; in tomorrow and in the work I hope to do, and in the sure reward which the future holds.

I believe in courtesy, in kindness, in generosity, in good cheer, in friendship and honest competition.

I believe there is an order somewhere for every man ready to take one.

"I have noticed that a good many business men ride on the back platform, instead of out in front. That means that they see events while they are happening, or after they happen but they do not anticipate events and prepare to meet them intelligently."

The man who buys the best seldom finds that he has paid too much.

* * *

The Canadian Hauck Burner Co. Port Hope, Ont., have developed an oil burner for use in the fire place of a hot air furnace or any type of heating device where fire is used in place of coal. The burner is so arranged that it can be regulated with all the control of a coal burner but with much more rapidity and with all the convenience of electricity thereby, possessing all the good features of both coal and electricity while eliminating the bad ones. Crude oil, properly mixed with air makes a clean hot fire which is all that is required, and being both cheap and convenient should easily become popular if properly introduced.

* * *

Quebec.—The "Canadian Recruit" was sunk in the Traverse about 45 miles below Quebec, after being in collision with the collier "Maskinonge", of the Dominion Coal Company's service. The "Canadian Recruit" is one of the C.G.M.M. steamers, and it will be remembered that she had a bad time on her first voyage, being caught in the ice in the Gulf, and badly damaged. An attempt was made to beach the "Canadian Recruit" after the collision, and this it is believed was partially successful.

HAMILTON

Foundry Facings and Supplies

MADE IN CANADA

High in Quality Low in Price

It is obvious that our thirty years' experience as Canadian manufacturers has placed us in an excellent position to produce high grade products at low prices.

Climax Silver Lead

We have many customers who tell us that this facing is the equal, if not the superior, of those extremely high-priced leads which are being offered the foundryman daily.

Climax Silver Lead is for medium and lighter grades of castings. It will brush on the mold. It is sold at a moderate price, and invariably proves its worth at the first trial.

Imperial Plumbago

Having been in constant use for thirty years among foundrymen making stove plate and ornamental work, it has naturally become a household word. If you are not already acquainted with its merit, give it a trial.

Canadians and Canadian Buying

Not everything required by Canadians can be bought in Canada. But, products "Made in Canada" are entitled to preference—providing, of course, that the quality and prices are the equal of the imported lines.

Of course we do not pretend to believe that you should buy Canadian products if you can get better value for your money elsewhere. We do claim, however, that every true Canadian should **make sure** that the merchandise which he requires **cannot be secured in Canada at a reasonable price** before sending his orders out of the country.

As the prosperity of Canada as a whole, and of your business in particular, depends largely upon the money in active circulation in the country, it is to the advantage of every man in Canada to adopt the slogan—

"Canadian money, Canadian made, should stay in Canada for Canadian trade."

—and live up to it!

The Hamilton Facing Mill Co., Limited

Head Office and Mills

Hamilton, Ontario, Canada

CLASSIFIED ADVERTISEMENT SECTION

TWO CENTS A WORD, including the "Canadian Foundryman" box numbers; minimum charge is $1.00 per insertion, for 50 words or less, set in 6 point type. Each figure counts as a word. Display ads., or ads. set in border, are at the card rates.

SITUATIONS WANTED

FIRST-CLASS MOLDER WANTS POSITION as foreman or assistant; have necessary ability and enthusiasm to make good. Expert on latest methods for economical production. Open shop preferred. Canadian and United States references. Distance no objection. Salary a secondary consideration. All correspondence strictly confidential. Address inquiries Box 2512, Canadian Foundryman. (c9f)

FOUNDRY FOREMAN REQUIRES POSITION —Practical foundryman with 15 years' experience in Great Britain, United States and Canada is open for engagement as foundry foreman in shop doing marine or stationary engine work, general jobbing or machine molding. Good at handling men, and well up in cupola practice. Apply box 5521, Canadian Foundryman.

FOR SALE

FOR SALE—MONARCH SIMPLEX MELTING Furnace. For Copper, Brass, Bronze, Aluminum, Ferro Silicon, Ferro Manganese, Gold, Silver, Etc. Will use oil or gas fuel. Practically new. For particulars, apply BURROWS REFINING CO., Ltd., Wellington St., Ottawa, Ont. (c.9.f.)

WANTED

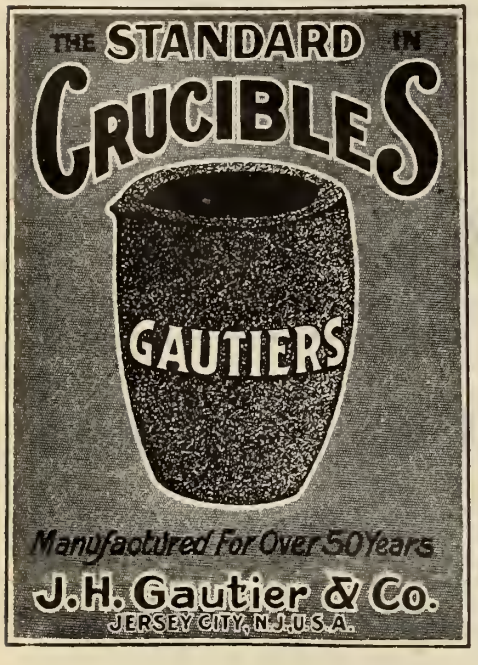
SECOND HAND SWING GRINDER SUITABLE for grinding heavy castings. Send description and price to Canada Electric Castings Co., Ltd., Orillia. (c11f.)

MOULDING SAND

Special attention given to rush orders. From famous NiagaraDistrict Pits.

A. D. McMILLAN

Telephone 1195 St. Catharines, Ontario



CHROMIUM DEPOSITS IN VARIOUS COUNTIES

Canada Has Increased Output from 121 Tons in 1914 to 33,000 in 1917.

India Also Had Large Increase.

Speaking on the importance of Chromium in the steel industry, a writer in "The Near East American" tells of various places where such a material is found. He says that originally large supplies were obtained from the deposits near Brusa, Asia Minor, the production of chromite in 1908 having been 29,000 tons. Later, Southern Rhodesia, and New Caledonia became the chief sources of supply, and in the pre-war years the German steel industry used to draw upon Asia Minor. The inquiry for chromite was stimulated by the war. Canada, which had an output of 121 tons in 1914, soon produced 33,000 tons in 1917, while India increased her output of 5,888 tons in 1914 to 57,773 tons in 1918. The Indian deposits are scattered over several provinces. The mineral has been found in the peridolite rocks of the Chalk Hills near Salem, Madras, and also in the Andamans. Another deposit area occurs two miles east of Yhamogia, in the Pishin district, and it consists of a rich vein-like mass with 54 per cent. of chroms oxide. Good supplies are also available in the districts of Mysore and also in Singhbhum, Behar. The regions have not been well exploited. In July 1914, the Beluchistan Chrome Company, Ltd., was registered in England to acquire leases of chrome areas covering 6,159 acres in the Hindubagh district of Beluchistan. A railway from Khanai to Hindubagh has been constructed, and the shipment commenced in March 1917.

Bailey & Bell Fire Brick Co.

Manufacturers and Importers of High Grade Fire Brick, Fire Clay and General Supplies. Special Shapes, Cupola Block, Stoker Brick, Boiler Tiles, Stove and Quebec Heater Linings.

MADE IN CANADA

1347-49-51 Dufferin St., Toronto. Phone Ken. 4335

THE SMALLEST PUMP IN THE WORLD

What is the smallest pump in the world? This is a difficult question to answer, but it would be equally difficult to light upon any pump at once smaller and simpler than that recently devised by a British Engineer. It consists of a piece of rubber tubing bent into a hoop, with a wooden frame outside the loop and a circular cam inside. By placing the cam out of centre and revolving it the rubber tube is squeezed in a rotary direction, giving a kind of "milking" action which will force liquid through it. One end of the tube then becomes the suction pipe and the other the delivery pipe of a very neat and efficient form of pump. The inventor after having made a pump out of a serviette ring and piece of rubber tubing has take out a patent for a regular engineering mechanism on the same principle. He proposes to use a flexible rubber or leather band suitably water sealed on its width, in place of the tubing, and cast iron or gun metal casing with suction and delivery branches. This type of pump, it should be noted, has no valve and will therefore be suited for use in cases where pump valves are apt to give trouble.

SHOT GUN CLEANER

A new device being manufactured by the Marble Arms & Manufacturing Company, Gladstone, Michigan., is said to give cleaning rods a double use. The new product is described as a Special Adaptor which enables an owner of Marble's .28 cal. Rifle Rod to use Marble's shotgun cleaner. This thus saves the owner of a .28 cal. rifle rod from buying an extra rod to clean his shot-gun. It is made with slotted tip and will fit either brass or steel rods.

ANODES

Any style or shape
Quality Guaranteed

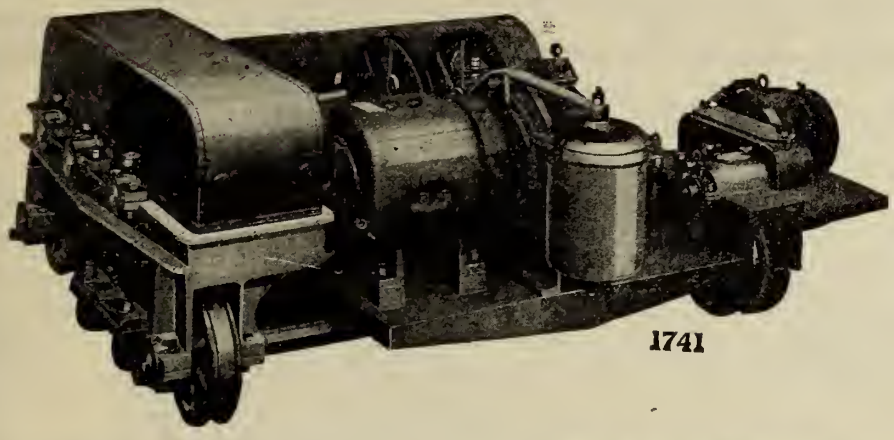
Why import your anodes when you can get guaranteed quality, quicker delivery, and can save duty and eliminate the annoyance of clearing at the customs by buying from us?

May we send you descriptive pamphlet and full particulars?

W. W. WELLS, Toronto

In Brass Bronze Copper Nickel Tin & Zinc

Foundry Equipment and Supplies



1741

We handle cranes of all descriptions as manufactured by The Whiting Corporation of Harvey, Ill.
Shown on the left is the type of trolley used on foundry cranes. Gears run in oil in dust-proof cases. Trolley built throughout to suit foundry conditions.

Morgan English Crucibles. The Pot that gives from 30 to 50 heats.

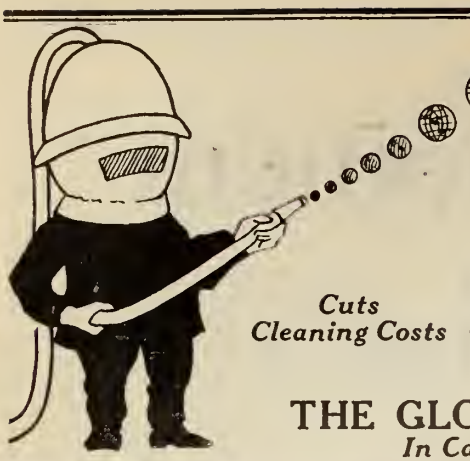
Core ovens and all necessary accessories.

These are but a few of the lines we handle. We are prepared to supply all foundry needs for brass, steel and iron castings. Particulars and prices of the lines in which you are interested upon request.

The Dominion Foundry Supply Co. Limited

"Everything for the Foundry"

MONTREAL, Que. **TORONTO, Ont.** **WINNIPEG, Man.**



Cuts Cleaning Costs

The Effective Enduring Abrasive

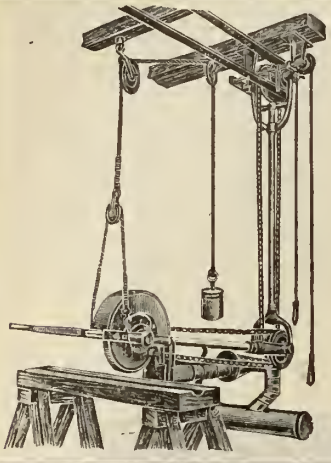
It's the impact in blasting that does the work. Sand under impact crushes quickly and pulverizes to dust. It must be replaced by new sand frequently. Globe Chilled Shot can be used 250 to 275 times before it becomes ineffective. It reduces storage bins; eliminates sand driers; reduces labor costs.

Send for samples.

GLOBE CHILLED SHOT

It gives you a better and quicker Blasting Job at a reduced cost.

THE GLOBE STEEL COMPANY, Mansfield, Ohio, U.S.A.
In Canada: Canadian Johns-Manville Company, Asbestos, P.Q.



Use Swing Grinders

and bring the wheel to the work.

For grinding Iron or Steel Castings, Steel Ingots, Billets and Bars, Rails, Steam-hammer Pallets, Plough Plates, Welded Work etc.

A light but powerful Machine, the result of many years' experience. Roller bearings throughout and V linked belting eliminate friction. Takes any size wheel from 12 in. x 1 1-4 in. to 16 in. x 4 in. without alteration.

The DOMINION FOUNDRY SUPPLY CO. Ltd., MONTREAL, will show you one of these machines and quote prices.

A. W. Sainsbury, Ltd., Sheffield, England

Telegrams "Sainsbury, Sheffield". Marconi Code.

How to Test Advertising

THE man who doubts the power of advertising belongs in the same class with the man who refuses to believe that the world is round simply because he can't get off somewhere at a distance and see its roundness for himself.

The merchant who fears to attempt advertising because he figures it as an "expense" is blind to his own interests. I personally know several men who, because they once tried advertising to the extent of a cheaply printed hand-bill and didn't find it necessary next morning to call on the police to keep the crowds of eager buyers from swamping their store, loudly and solemnly aver that "advertising doesn't pay."

Advertising *does* pay.

The most successful merchants are the merchants who believe most thoroughly in advertising and who practice their belief.

But advertising, in order to pay, has got to be *intelligent* advertising.

The day of hashed-over superlatives — "best goods," "lowest prices," "best stock in town," "greatest bargains ever heard of," and so on—has passed.

People have learned to distinguish the *truthful* advertiser from the blatant behind-the-times storekeeper who believes that, so long as *he* claims to have the best goods on earth, or under the earth, or within wireless distance of the earth, people will break their necks trying to get to his counters in the forefront of the crowd.

Put some *brains* into your advertising.

Don't let the office boy write your announcements in between his other duties.

Don't doubt the business-getting and business-building power of intelligent and informative publicity — and you will find that advertising *does* pay.

—Jerome P. Fleishman.

CRANE FACTORY WASH SINKS

meet all the requirements of Factory Sanitation and are made strong and durable enough to stand the test of severe usage.

Manufacturers of Valves, Fittings and Piping Equipment and Distributors of Pipe, Plumbing and Heating Supplies.

CRANE
LIMITED
HEAD OFFICE & WORKS
1280 ST. PATRICK STREET
MONTREAL

Branches and Warehouses:
HALIFAX, OTTAWA, TORONTO, WINNIPEG, REGINA, CALGARY, VANCOUVER.

Sales Offices:
QUEBEC, SHERBROOKE, HAMILTON, VICTORIA.

CRANE-BENNETT
Limited
Head Office and Warehouse:
LONDON, ENGLAND.

Sales Offices:
MANCHESTER, BIRMINGHAM.

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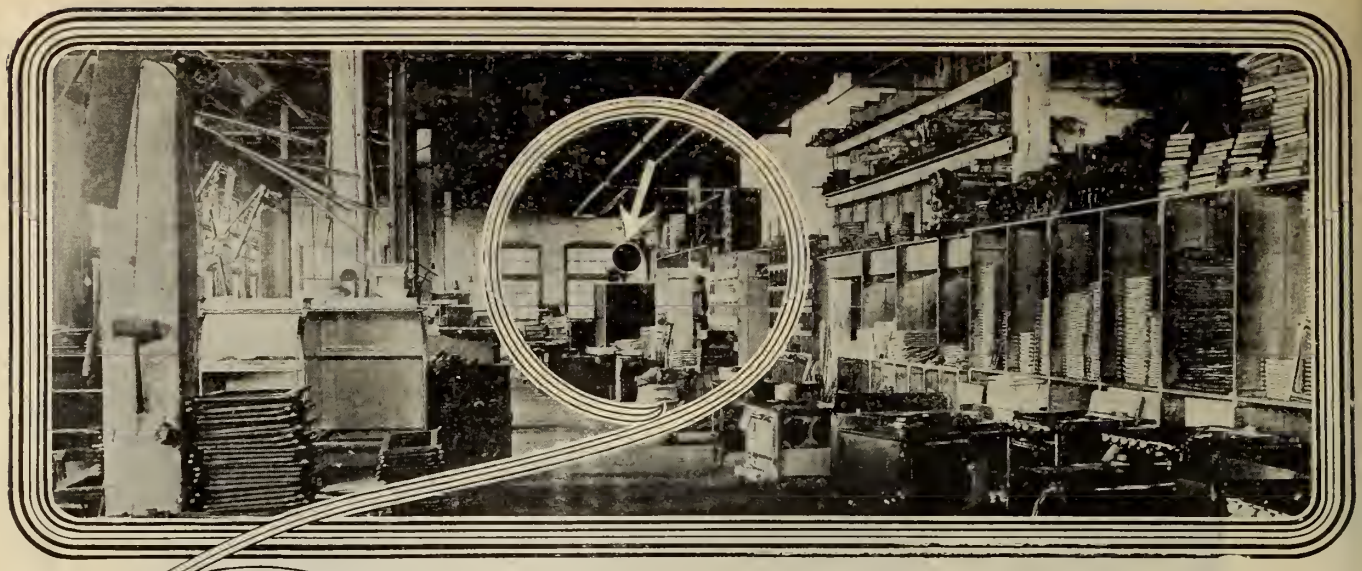
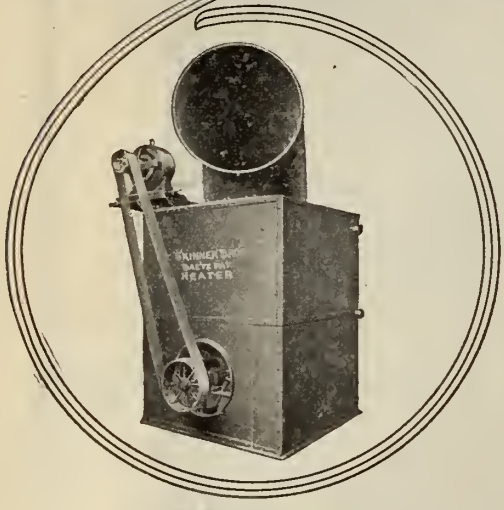




Why Heat Your Factory Only in Spots?

The Skinner Bros. (Baetz Patent) Heating System will heat all of the open space in your factory all of the time —there will be no places continually too warm while others are too cold, as is usually the case with old-time heating systems.

Simple and Economical

Skinner Bros. (Baetz Patent) Heaters operate without outside pipes or ducts. They are portable and require no foundations—cost of installation is 15 per cent to 50 per cent. less than any other system —operating cost is equally low. The mild, constant circulation of warm air does not cause drafts or air blasts, raise floor dust or create other conditions injurious to the health of employees.

Get Further Details

The principle of operation of Skinner Bros. (Baetz Patent) Heaters is briefly described at the left. Performance is guaranteed on a strictly money-refund basis. Complete detailed information and list of users will be sent on request. Please use the coupon.

Mechanical Details

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a powerful fan-wheel. Coils are heated by exhaust or live steam. Cold air is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, is diffused through outlet hoods to every part of the open area. No pipes or ducts used. The fan is operated by any power available.

Direct-Fired Type

Where steam is not available, we supply our direct-fired type DF, which burns coal, coke or wood. Built on the same scientific principle as type SC. The fan is operated by any power available.

Skinner Bros. Mfg. Co., Inc.,
1438 South Vandeventer Ave. St. Louis, Mo.

Boston ..... 449 Little Bldg. Chicago ..... 1508 Fisher Bldg.
Buffalo ..... 706 Morgan Bldg. Indianapolis ..... 330 Occidental Bldg.
Cleveland ..... 616 Marshall Bldg. New York ..... 1706 Flatiron Bldg.
Minneapolis . 806 Metropolitan Life Bldg.

Skinner Bros.
Baetz Patent HEATING SYSTEM

Skinner Bros. Mfg. Co., Inc.
1438 S. Vandeventer Avenue, St. Louis, Mo.
Please send complete details on Skinner Bros. (Baetz Patent) Heaters to
Firm .....
Address .....
Building used for.....
We can / cannot use steam.

If It's a Herman It's Worth Using

THE design of our Jarr Independent Rollover and Pattern Drawing Molding Machines has been proven correct by that greatest of all tests—actual service. And the materials used in their construction are just as good as is their design!

It Made Its Way by the Way It's Made

OUR plant is designed to build Jarr Independent Rollover and Pattern Drawing Machines to take care of all your work of a medium and larger nature. Let our Service Department help you decide your requirement for such work.

Herman Pneumatic Machine Company

GENERAL OFFICES: Union Bank Building, PITTSBURGH, PA.

MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U.S.A.

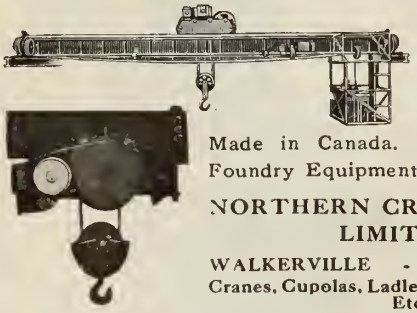
Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London, S.W., Eng.

Used for Commercial Purposes for More Than Forty-four Years, **Scarfe's** Surface Satisfaction Paints and Varnishes

SCARFE COMPANY, LIMITED

BRANTFORD - - - ONTARIO

CRANES

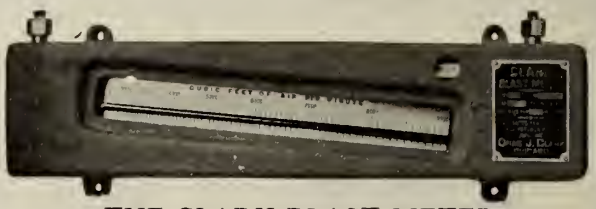


Don't buy a crane or hoist without investigating Northern Products—Made in Canada. Also a line of Foundry Equipment.

NORTHERN CRANE WORKS LIMITED

WALKERVILLE - - ONTARIO

Cranes, Cupolas, Ladles, Hoists, Tumblers Etc.



THE CLARK BLAST METER

indicates the number of cubic feet of air or gas passing per minute.

The Meter is furnished in any capacity desired, each one built to order and guaranteed in every respect. Several hundred are in use in smelters, steel works, coke plants, etc.

Booklet cheerfully sent—write for it.

CHAS. J. CLARK BLAST METER CO.

Gladbrook, Iowa

ANGULAR GRIT

SCIENTIFIC METALLIC BLASTING ABRASIVE

Trade Mark

Adopt metallic abrasive instead of sand. Angular Grit will reduce your costs — one hundred pounds of grit will outlast five tons of sand. It cleans faster, requires less handling and less storage space, and reduces dust 80%. Write for samples.

Pittsburgh Crushed Steel Co. Sole Manufacturers

PITTSBURGH, Pa., U.S.A., Established 1888

Canadian Representatives: WILLIAMS & WILSON, Ltd., Montreal, Canada

How Do You Find Business?

Some one has said "BY GOING AFTER IT" and might have added "By offering what the customer wants."

Sand-Blasted castings will get the business because they are worth more to the customer.

For every plant there is a

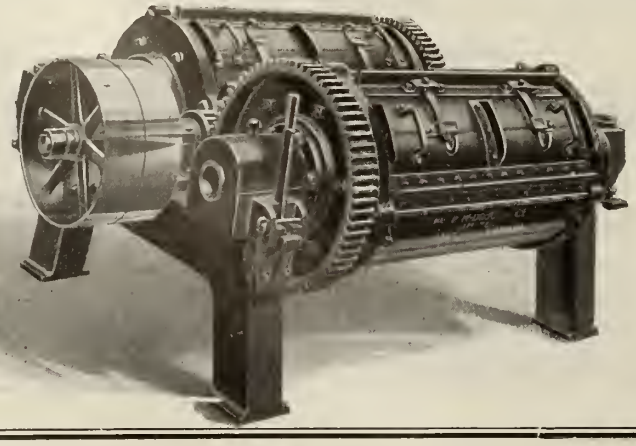
PANGBORN

PANGBORN CORPORATION ALL-WAYS SERVICE AND ALWAYS HAGERSTOWN, MD

HAGERSTOWN, Md. P. O. Box 8508

SAND-BLAST

That will cut your cleaning cost.



EXHAUST TUMBLING MILLS BUILT IN DOUBLE FILE

Constructed in the same efficient manner as all other McDougall products.

Each Mill may be run separately, which proves a decided advantage when filling or emptying.

Properly protected Ring Oiling Bearing.

Guaranteed for Long, Continuous, Satisfactory Service.

THE R. McDOUGALL CO., LTD.

GALT, ONTARIO

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

If what you want is not listed here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

ABRASIVE MATERIALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co. Ltd., The, Hamilton, Ont.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J. C., Toronto, Ont.

AIR COMPRESSORS
Holden Co., Ltd., The, Montreal.
Mussens, Ltd., Montreal, Que.

AIR ORILLS
Holden Co., Ltd., The, Montreal.

AIR HOIST
Holden Co., Ltd., The, Montreal.

AIR HOSE
Holden Co., Ltd., The, Montreal.

ALBANY SAND
Pettinos, George F., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Venango Sand Co., Franklin, Pa.

ALLOYS
Stevens, Frederic B., Detroit, Mich.

ANOOES, BRASS, COPPER, NICKEL, ZINC
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

ARGON
Dom. Oxygen Co., Toronto, Ont.

AUTOMOBILE MACHINERY
Preston Woodworking Machinery Co.

BANO SAWS
Oliver Machinery Co., Grand Rapids, Mich.

BARRELS, TUMBLING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Pangborn Corporation, Hagerstown, Md.
Obermayer Co., S., Chicago, Ill.
Slater & Barnard, Ltd., Hamilton, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BARRELS, SANOBLAST
The American Foundry Equipment Co., New York City.
Pangborn Corporation, Hagerstown, Md., U.S.A

BINDERS, SANO
Holland Core Oil Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich
Woodison, E. J. Co., Toronto, On..

BLAST GAUGES—CUPOLA
Chas. J. Clark Meter Co., Gladbrook, Iowa.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BLOWERS
Dominion Fdry. Supply Co., Ltd., Toronto,
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BOILERMAKERS' TOOLS
Holden Co., Ltd., The, Montreal.

BOILER COMPOUNO
Reynolds & Co., Toronto.

BDILER GRAPHITE
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Pettinos, George F., Philadelphia, Pa.

BOILERS, STEAM
Ministry of Munitions, London, England.

BOLTS AND NUTS (All Kinds)
Steel Co. of Canada, Hamilton, Ont.

BOLTS, STDVE
Steel Co. of Canada, Hamilton, Ont.

BOOTS
C. H. Watt, Amherst, N.S.
Ministry of Munitions, London, England.

BORING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

BOTTOM PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

BRAKE SHOES, WHEEL TRUEING
Can. Hart Wheels, Ltd., Hamliton, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRASS GOODS, VALVES, ETC.
Crane, Ltd., Montreal.

BRICKS, RUBBING
Can. Hart Wheels, Ltd., Hamilton, Ont.
Frederic B. Stevens, Detroit, Michigan.
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, FOUNORY ANO CORE
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton. Ont.
Manufacturers' Brush Co., Cleveland, O.
National Engineering Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.

BUFFS ANO BUFFING ANO POLISHING COMPOSITIONS
Can. Hanson & Van Winkie Co., Toronto, Ont.
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.

BURNERS, CORE OVEN
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Can Hanck-Burner, Port Hope, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Woodison, E. J., Co., Toronto, Ont.

CALKING HAMMERS
Holden Co., Ltd., The, Montreal.

CARBON BLACKING
Pettinos, George F., Philadelphia, Pa.
Woodison, Co., E. J., Toronto.
Stevens, Frederic B., Detroit, Mich.

CARS, CORE OVEN ANO FOUNORY
Dominion Fdry. Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canadian Pattern & Die Castings Co., Ford City, Ont.

CHAIN BLOCKS
Mussens, Ltd., Montreal, Que.

CHAPLETS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Hamilton Facing Mill Co., Hamilton, Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J., Co.. Toronto, Ont.

CHEMISTS—SEE METALLURGISTS CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.

CHIPPING HAMMERS (PNEUMATIC)
Ceveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CHISEL BLANKS
Holden Co., Ltd., The, Montreal.

CLAMPS, FLASK
Diamond Clamp & Flask Co.
Frederic B. Stevens, Detroit, Michigan.
Obermayer Co., S., Chicago, Ill.
Woodison Co., E. J., Toronto.

CORE BARROWS
Sterling Wheelbarrow Co., Milwaukee.

CORE BINOERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Michigan.
Holland Core Oil Co., Chicago, Ill.
Hamilton Facing Mill Co., Hamilton. Ont.
Obermayer Co., S., Chicago, Ill.
Woodison, E. J. Co., Toronto, Ont.

CORE BREAKERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.
Holden Co., Ltd., The, Montreal.

CORE COMPOUNOS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Mich.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
The American Foundry Equipment Co., New York City.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE-MAKING MACHINES
Blystone Mfg. Co., Cambridge Springs, Pa.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip Co., Akron, O.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Obermayer Co., S., Chicago, Ill.
Reynolds & Co., Toronto.
Scarfe & Co., Ltd., Brantford, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS—SEE OVENS
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE PLATES, STEEL
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE SANO
Venango Sand Co., Franklin, Pa.

CORE SANO MIXER
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip Co., Akron, O.

CORE SANO MIXERS ANO SANO MIXING AND COMPOUNO MILLS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Hamilton.
Joseph Dixon Crucible Co., Jersey City, N.J.
National Engineering Co., Chicago, Ill.
Obermayer & Co., S., Chicago, Ill.
Woodison, E. J., Co., Toronto Ont.

CORE REOUCERS
National Engineering Co., Chicago, Ill.
Wadsworth Core Machine & Equip. Co., Akron, O.

CORE TAPERING ANO CUTTING-OFF

CORE TESTING MACHINE
The American Foundry Equipment Co., New York City.
National Engineering Co., Chicago, Ill.

CORE WAX
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

COUPLINGS, BOWES (PNEUMATIC)
Cleveland Pneumatic Tool Co., The

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Independent Pneumatic Tool Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CUTTERS, CORE
Wadsworth Core Machine & Equip. Co., Akron, O.

CRANES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Mussens, Ltd., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES
J. H. Gautier Co., Jersey City, U.S.A.
Frederic B. Stevens, Detroit, Mich.
Woodison Co., E. J., Toronto, Ont.

CUPOLAS
Bailey & Bell Fire Brick Co., Toronto, Ont.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Northern Crane Works, Ltd., Walkerville, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPDLA LININGS BLOCKS
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Dominion Foundry Supply Co., Ltd Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM
Can. Hanson & Van Winkle Co., Toronto, Ont.
Frederic B. Stevens, Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

OIPPERS, GRAPHITE
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City., N.J.
Woodison, E. J., Co., Toronto, Ont.

OOWEL PINS
Diamond Camp and Flask Co.

DRAINAGE FITTINGS
Crane Ltd., Montreal.

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Stevens, Frederic B., Detroit, Mich.
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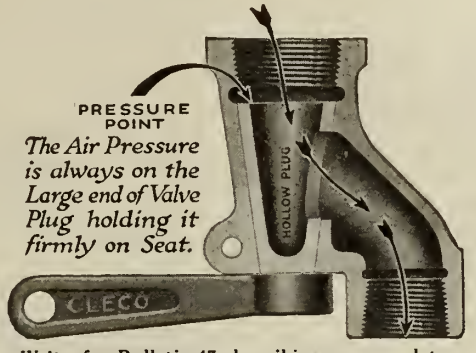

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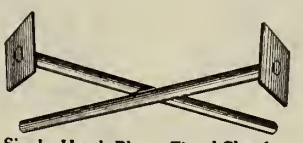
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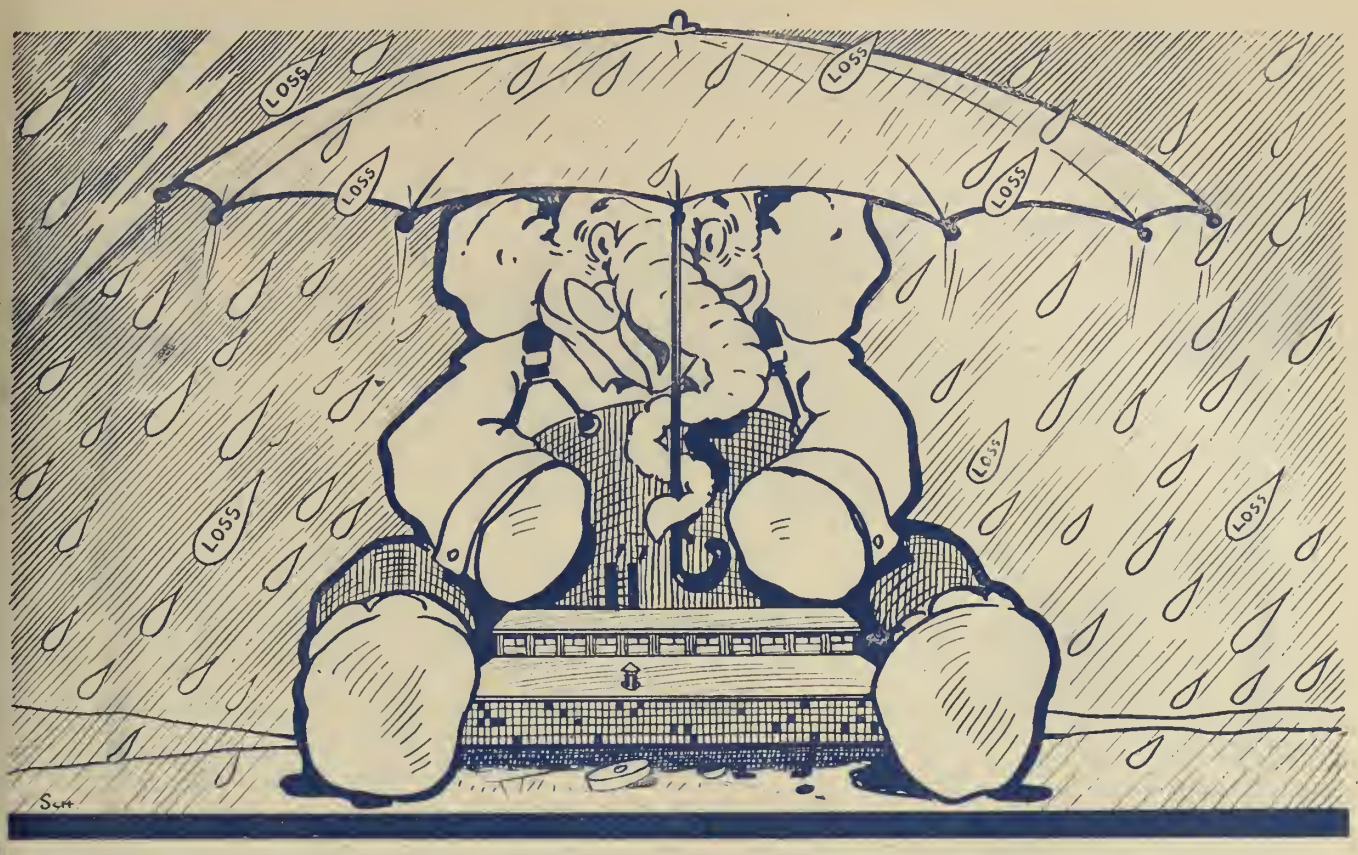

Foundry Protection

Sometimes it is down in the foundry and sometimes it is up in the office where we find original ideas relating to uses of foundry material.

This time it comes from the executive end—from the office.

A MANAGER WRITES:—"I have read so much about 'Protection' lately that I sighed for a little for myself. I needed protection from the kicks and complaints that are of a sort of the daily grind. You know each seller claims his material is the best, and I believe sometimes our men know what is the best for us.

"I bought a barrel of your 'Columbia Parting' and at the same time, one of another make, had them opened and placed side by side in the foundry. A little later I took a bird's eye view of the same two barrels. I found yours was two-thirds used up and the other was only started; only trials had been used from the other barrel but they had kept steadily at yours, as a rat keeps at a piece of cheese. You may say yours last longer but I am buying it because it do n't last as long. I believe my men know what is best to use for their work and that is the reason you get my orders."

There's a man of real originality; he don't overshadow cold facts with untried theory nor is he governed by the parrot tale of the seller.

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You can buy it as you would a pair of gloves—before buying it, I'll send you free trial box with shake-bag if you will only say so.

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Cupola Blocks, Fire Brick and Clay

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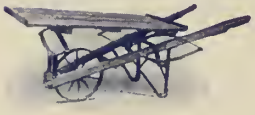

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

Vol. XII Publication Office, Toronto, October, 1921 No. 10

FIRE BRICK SPECIAL

NOW is the time to re-line your Cupola, re-build your Core Ovens. Replace your Boiler Settings, re-line your Oil, Malleable, Brass or Heat Treating Furnaces.

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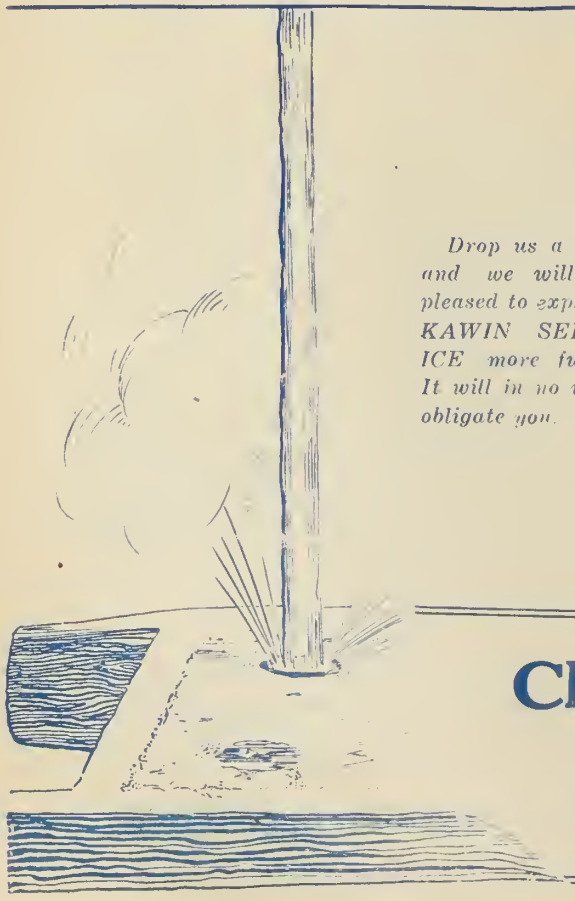

Drop us a line and we will be pleased to explain KAWIN SERVICE more fully. It will in no way obligate you.

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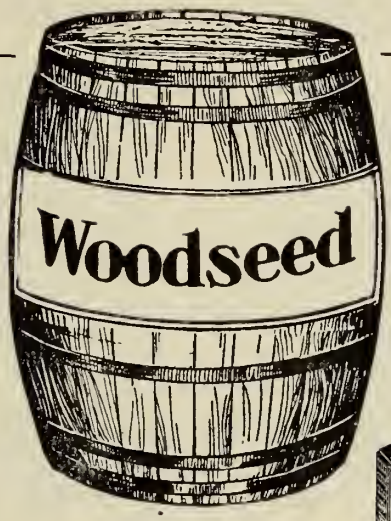

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The steel bands are for ramming up in the mold. In ordering give size of flask parting. Our standard is to make the outside of the band ⅛th smaller. This allows it to drop easily and ram out tight against the flask and hold it.

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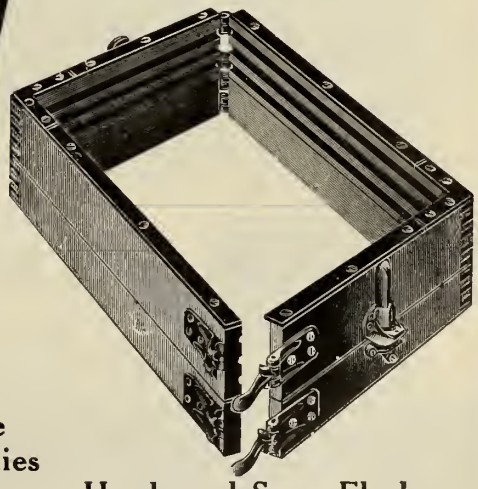

Hardwood Snap Flasks

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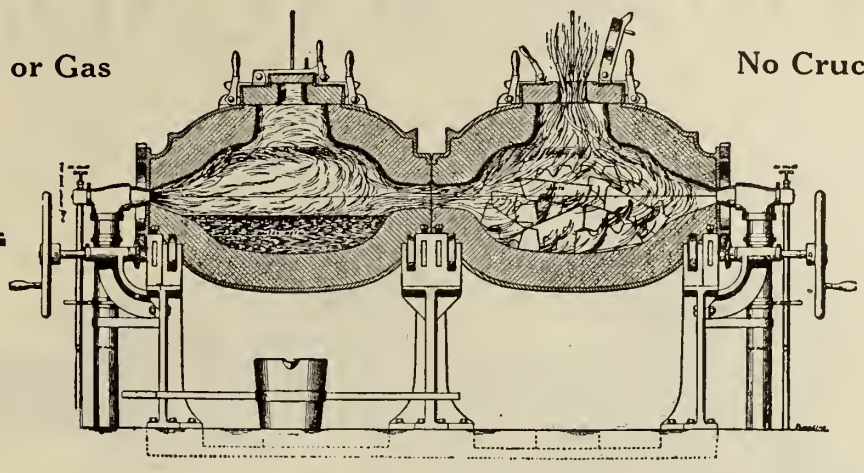
Oil or Gas

No Crucible



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No Lost Time!

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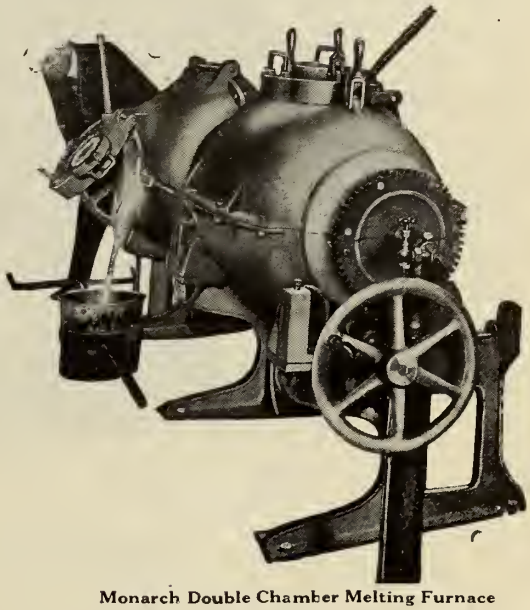
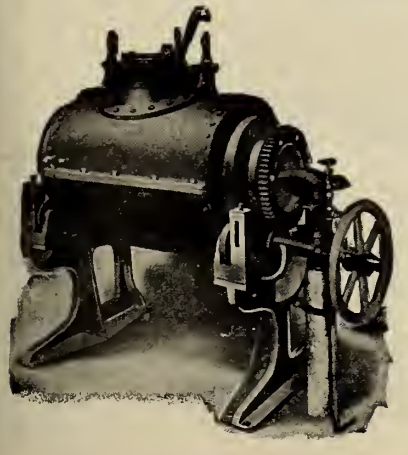


Monarch Double Chamber Melting Furnace



Monarch Rocdwell Single Chamber Furnace -- "Simplex"

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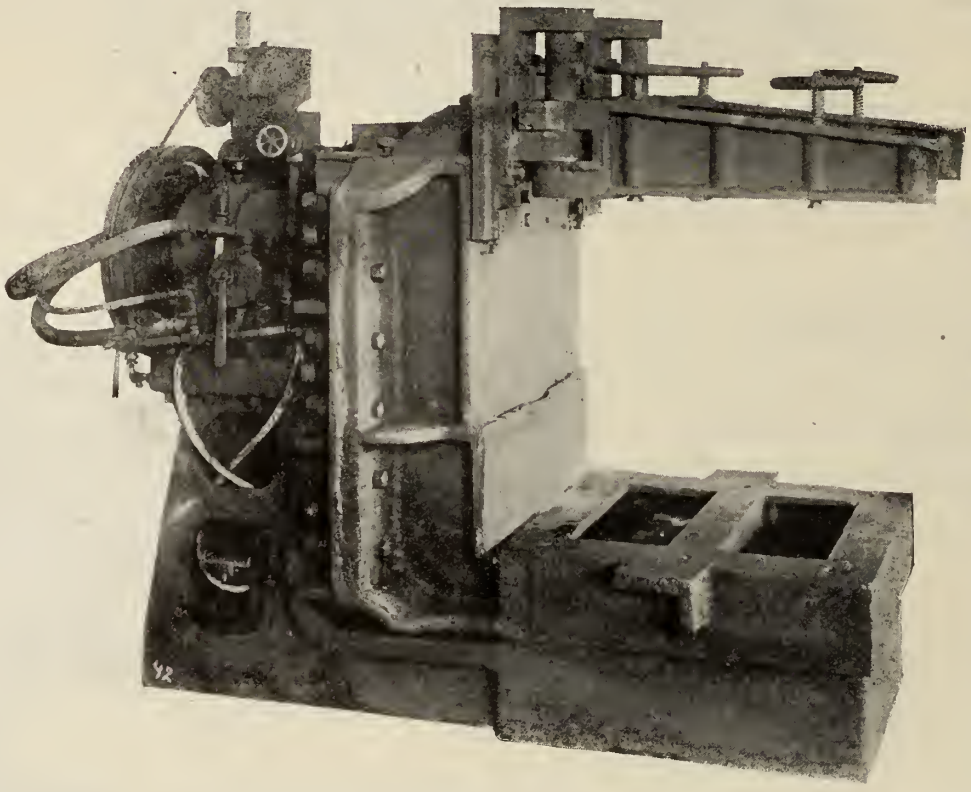

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HUNDREDS of repair jobs that formerly kept rolling stock idle for weeks, and even months, are now speedily, economically and permanently effected by the oxy-acetylene process.

And Dominion Oxygen, because of undeviating purity and rapid deliveries, is constantly employed in railroad maintenance as well as in all those industries where time is the vital factor and only the proven product can qualify.

Shipped in portable, high-capacity cylinders, equipped with the leakless Wedge Valve, Dominion Oxygen is delivered anywhere and in any required quantity.

North, East, South or West—your order forwarded to the nearest of our six centrally located plants and distributing stations means that your oxygen travels by the quickest route.

And all orders are filled on the day they are received.

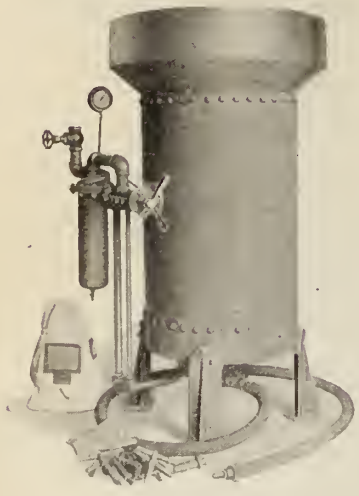
DOMINION OXYGEN COMPANY, LIMITED

Hillcrest Park, Toronto

Hamilton Merritton Montreal Welland Windsor

D22

SLY SAND BLAST EQUIPMENT "UP - TO - DATE"



Pressure Tank

10 to 100 lbs. Pressure can be used for efficient blasting of various materials.

SIMPLICITY and EFFICIENCY combined in a SLY SAND BLAST PRESSURE TANK

Simple because only one operating valve controlling Air Pressure, Volume of Sand, Amount of Air, Reversal of Air for Removing Obstructions.

No moving parts whatever beside control valve.

Two handholes for easy access to interior or Tank.

Efficient because of perfect control of Sand and Air Mixtures at all times; Sandblast hose 1¼" I.D., large enough for largest abrasive, light enough for ease of handling; Filling Valve opens and closes automatically when air is turned off and on; Sand Storage Hopper of same capacity as Tank proper.

Equally adapted for SAND, SHOT or STEEL GRIT.

Made in quantities in one size only meaning more value for less money.

Capacity of 30" x 48" Tank, 1200 lbs. Sand.

The W. W. SLY MFG. CO.

New York
Chattanooga
Birmingham
Paris, France

Main Office and Works:
Cleveland, Ohio

Chicago
Detroit
St. Louis
Los Angeles

Representatives for Quebec and Maritime Provinces:
WILLIAMS & WILSON, LIMITED, MONTREAL, QUE.

The SLY Line of up-to-date Foundry Equipment

Steel Tumbling Mills
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Sand Blast Mills
Sand Blast Mills—Tilted
Exhaust Fans
Sand Blast Rooms
Sand Blast Cabinets
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers

TABOR
3-inch Plain Jarring Machine For Small Molds And Medium Sized Cores

3" Tabor Jarring Machine with 12" x 14" Table

A Necessity in Every Foundry

SEND FOR BULLETIN M-J-P

THE TABOR MFG. COMPANY

6225 State Road, Tacony, Philadelphia, U.S.A.

THE PRESTON

Ballbearing Electric Sand Riddle

Screw the socket in and the Preston is ready for actions. No fuss, no bother. One cent an hour covers Power Costs.

—only ¼ H. P. Motor required.

—all parts enclosed.

—can be pushed anywhere with ease.

—takes 18" hand riddle.

The riddle operates exactly like a man sifting sand. Sifts as fast as a man can shovel into it.

Install at Our Expense—NOW

WE have on record so many instances of the success of the Preston Electric Sand Riddle that we have no hesitancy in offering to place it in your plant on a trial basis at our expense. Don't delay about filling in this form—clip it and mail it now while you have it in mind.

The Preston Woodworking Machinery Co., Limited.
Preston, Ontario.

Gentlemen:—
Please ship us (me) on 15 days' trial by.....freight prepaid one "Preston" Ball Bearing Electric Sand Riddle for .... cycle .... volt current.

At the end of the above trial period I am (we are) privileged to return the riddle if not satisfied in every way.

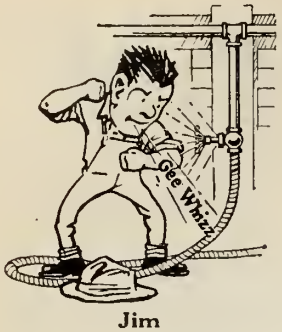
Name .....

Address .....

IF you have not an electric sand riddle you are in competition with many who have these cost-cutters, and you are at a big disadvantage. The Preston is a paying proposition from every angle. We have it for immediate shipment, either 25 or 60 cycle.

The Preston Woodworking Machinery Company Limited

PRESTON, ONT., CANADA



Jim

Do Your Air Valves Leak?

Well! Go into your shop when the power is shut off and you will hear leaks at every valve.

Jim Says:—Gee Whiz: They are all leakin'—there ain't a Valve in the shop but what is spurtin' air, and ye can't stop 'em—the compressor's workin' overtime and the coal pile is meltin' like a snow ball in June. **Every leak is an extra load on your Compressor, an added pull on your "Coal pile" and a steady drain on your "Cash box."**

Put your "Valve Troubles" up to us—Listen!

Bill says:—"Leaks," there ain't none; we stopped 'em all with **Cleco Valves**—they are all over the shop now—we don't have to waste time patchin' leaky valves, you bet.

Ask us for a sample valve and test it until you are satisfied—then buy some; you can't lose.

Cleco Air-Valves are pressure-seated—the air pressure is always on the large end of "Plug," holding it firmly on seat. No packing or springs used, the air never comes in contact with the seat, therefore no seats to replace—or springs to renew.

Cleco Valves improve with use—they require no attention after installation.

Bulletin 48 illustrates and describes our complete line of Air Valves and Hose Fittings. Mailed on request.

Bill

Cleveland Pneumatic Tool Co. of Canada, Limited

84 Chestnut St., Toronto 337 Craig St. West, Montreal

"HAMILTON"

PIG IRON

THE STEEL COMPANY OF CANADA LIMITED

WE absolutely guarantee the quality of "HAMILTON" MACHINE CAST FOUNDRY AND MALLEABLE PIG IRON because we control its production from the mines to the finished product.

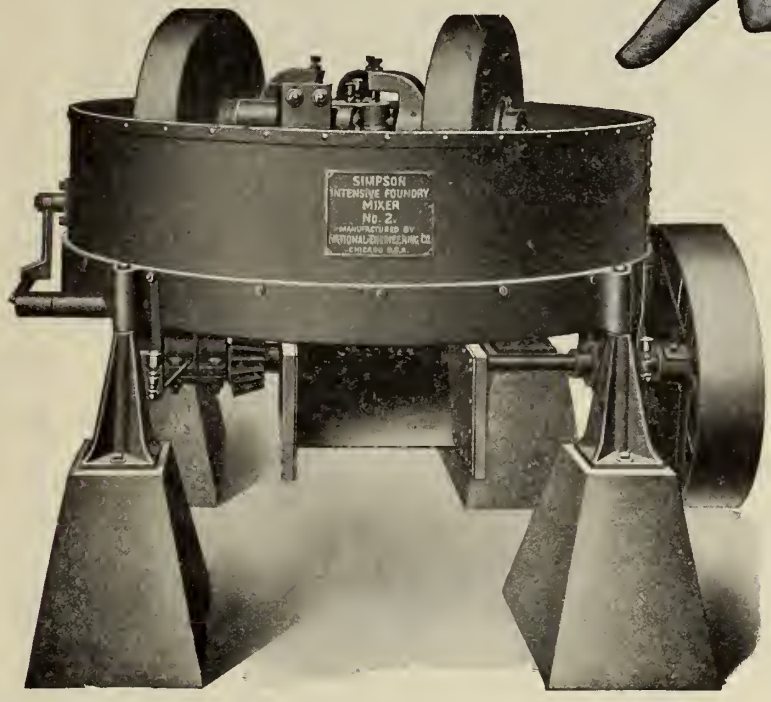
Iron Ore and Coal from our own mines; low sulphur By-Product Coke produced at our own plant. All pigs are machine cast and uniform in size, and, if desired, shipments can be made the day the order is received.

HAMILTON - MONTREAL

SIMPSON

INTENSIVE FOUNDRY MIXER

Reduces the Cost of Manufacture
Improves the Castings



"The Product of a Practical Foundryman"

What it Means in Your Plant:

Reduces new sand content for facing sand. Cuts down percentage of binder for core sand. Automatic discharge, with minimum labor expense. Large capacity with small operating cost. Less defective castings.

In these days of intensive competition you can't afford to be without the "Simpson"—for all kinds of sand mixtures in foundries producing steel, gray iron, brass, malleable and aluminum castings.
Four sizes.

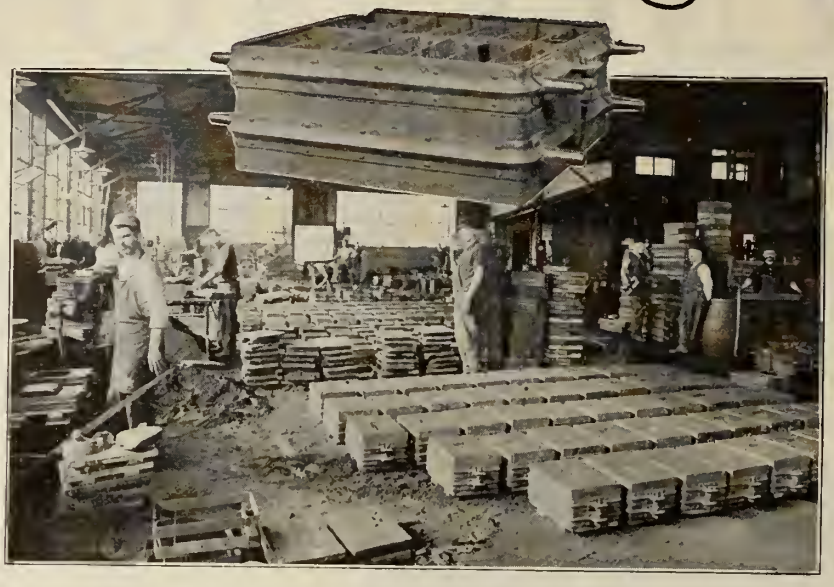
Simpson Mixer used in nearly one thousand foundries

Send for Full Information

NATIONAL ENGINEERING COMPANY

549 W. Washington Blvd.
CHICAGO, Ill.

Sterling



Spring City Foundry Co., Waukesha, Wis.

Service Record

Years in service—4 years. Nature of casting — Fly Wheel Housing. How Used—Power Bumper. Size of flask—26"x26" x7"Copex 4" Drag. Weight of Flask — including bars 180 lbs. Flasks of this size in use 150. Total Sterling Flasks in use 3,186.

Citation

A flask for our work must be extremely accurate.

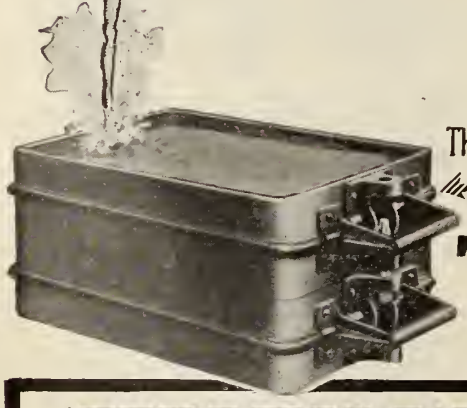
It must lay level on our machines and must be interchangeable.

The Sterling Flask successfully meets these requirements, and is also a light flask to handle

Yours truly,

C Reechl Mgr.

The Only Line Of Rolled Steel Flasks



STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

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CANADIAN AGENTS-MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VANCOUVER

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CHICAGO
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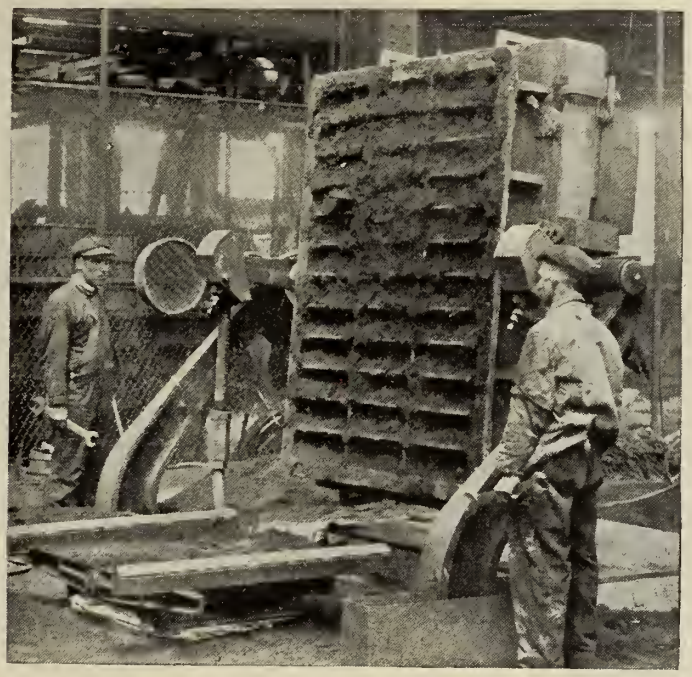
If It's A Herman It's Worth Using, It Made Its Way by the Way it's Made



Faster
MOLDING

Easier
MOLDING

Cheaper
MOLDING

The Big Three in Production

Faster Molding, **Easier** Molding, **Cheaper** Molding—these are the **big three** conducive to more extensive output on a more economical basis. Do you say it's impossible for a single molding machine to give you all this. **Sure** it is in any machine but Herman! Any machine molder who has ever used a Herman will tell you this machine most closely fills the bill of modern production.

Our plant is equipped and the design of our Jarr Independent Roll-over and Pattern Drawing machines is such to take care of your work of a medium or larger nature.

We will be thankful if you will send us your inquiry and let our Service Department advise with you on your molding machine requirements for such work.

Herman Pneumatic Machine Company
GENERAL OFFICES: Union Bank Building, PITTSBURGH, PA.
MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U. S. A.
Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London, S. W., Eng.

AMERICAN

Every foundryman knows the advantages of the round flask.

An increasing number are reaping the special advantages and economies of the American Corrugated type, here shown in use by Worthington Pump and Machinery Corp.

Will you give our printed matter on flasks a few minutes time to explain?

What shapes and sizes of flasks do you use?

EQUIPMENT

THE AMERICAN FOUNDRY EQUIPMENT CO.
366 MADISON AVENUE, NEW YORK CITY.

DIAMOND

STEEL JACKETS

These accurate, perfectly fitting jackets are made entirely of heavy gauge steel in a wide variety of styles. Illustration shows a taper side. The "Diamond" trademark stands for superiority.

Sold in Canada by:

Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

DIAMOND CLAMP & FLASK CO.
40 N. 14th St. RICHMOND, INDIANA

Tumbling Barrels

Tilting and Burnishing Barrels

CANADIAN MADE

N. SLATER CO., LIMITED
ACME STAMPING & TOOL WORKS BRANCH
Hamilton, Ontario

"VOLTA" Electric Furnaces

Steel Furnace

Steel Furnaces
100 lbs. to 15 tons capacity.

Grey Iron and Ferro-Alloy Furnaces. In sizes to suit customer.

Brass Furnaces
Three - Phase, in standard sizes of ⅛, ¼, ½ and 1 ton capacity.

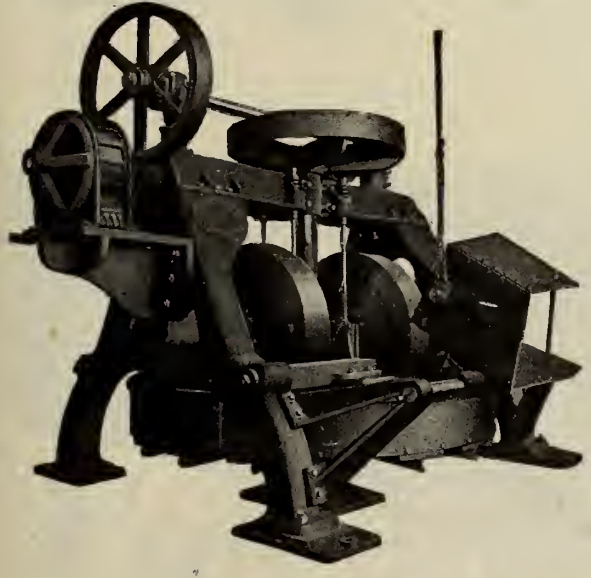
Brass Furnace

Electric Furnace Accessories of all kinds.

Estimates and General Information cheerfully given.

The Volta Manufacturing Company, Ltd.
WELLAND, ONT.

Frost
Wet Pan Sand Mill
for Steel Foundries



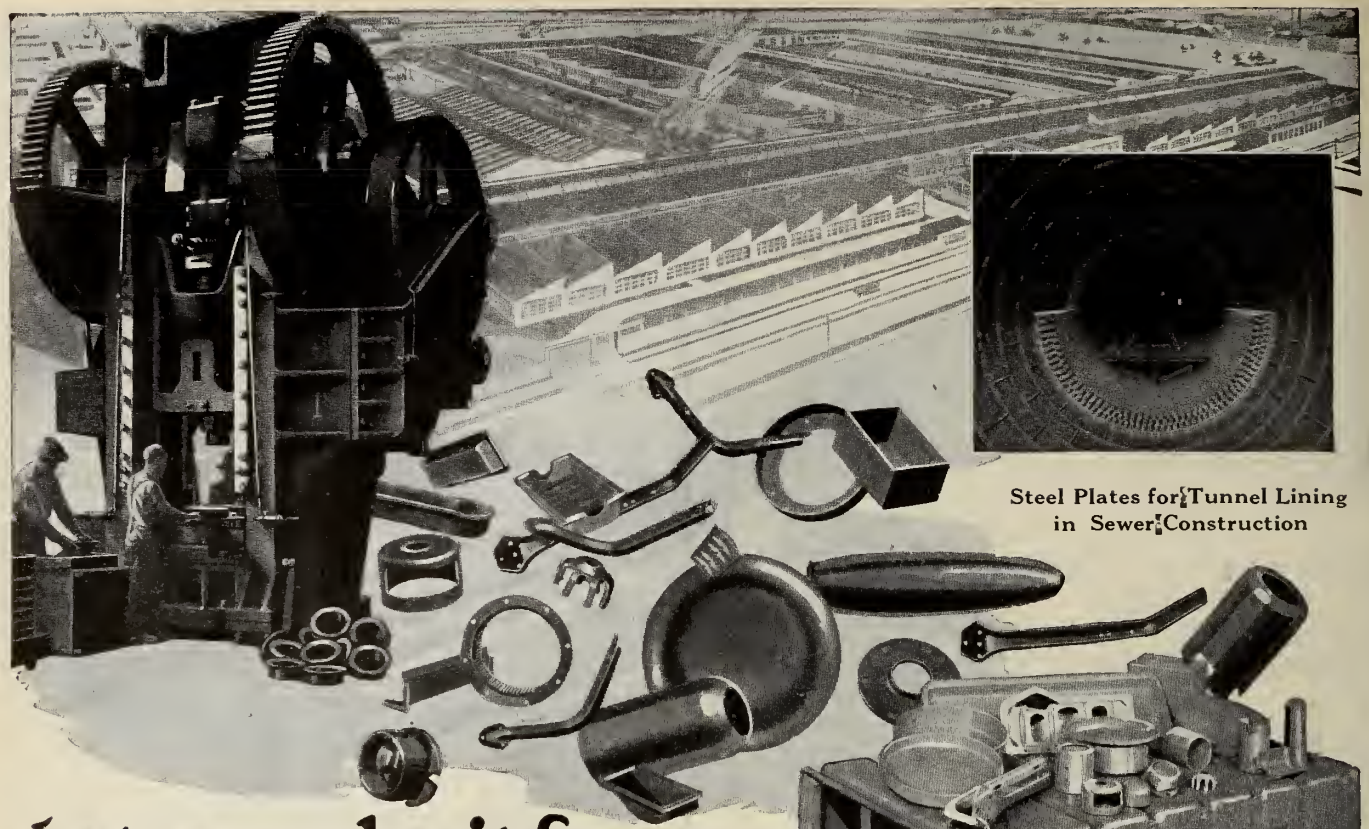
The Frost Mfg. Co.
112 W. Adams St.
CHICAGO

Bull Ladles in sizes 50 lb. to 400 lb.
Hand Shanks to suit, with single, double, or swivel ends.
Crucible Tongs and Shanks. Pick up and shake out tongs.
Crane Ladles, without gears.
Sulky Ladles, 400 to 600 lbs.
Tea Kettle spout ladles.
Standard steel core ovens.
Swing Grinders.
Sand Blast for cleaning castings or forgings.

Steel Slip Over Jackets, Steel Bands, Steel Core Plates.

Write for prices on your requirements.
Buy direct from manufacturer
Information cheerfully given

Damp Bros. Manufacturing and Welding Co.
TORONTO



Steel Plates for Tunnel Lining in Sewer Construction

Let us make *it* for you

Railroad Car Parts Household Appliances

For any of your steel parts made by stamping, shearing, punching, slotting, bending, forming or welding you will find our plant facilities unsurpassed. So long as it is steel, whether made from plates, strips, sheets, flats or bars, let us make it for you. Our steel fabricating equipment is complete, including presses, shears, punches, drills, welders and machine shops for dies.

Electrical Equipment Automotive Parts

Our engineering force will be glad to work with you in designing steel parts for your product. Our long experience will be valuable to you in saving your money and giving you a better product. This service is yours without obligation.

Write for information, suggestions and quotations.

Trussed Concrete Steel Co. of Canada, Ltd.
Walkerville, Ont.

Three Years Ago a Firm Wrote Us:

"Nothing doing in the correspondence-school-way of running a foundry as we have been operating ours very successfully for 30 years."

To Which We Replied:

"We have been selling McLAIN'S SYSTEM to foundrymen for years and have greatly increased the knowledge and efficiency of foundry foremen, superintendents and others. In addition to our printed instructions we act in advisory capacity thru our service department and some firms save the cost of McLAIN'S SYSTEM in one week, therefore we are not to be considered in the same class as the average correspondence school, as we deal with foundrymen exclusively.

"Every employer worthy of the name is anxious to build up his organization and is anxious to fit ambitious men for bigger jobs as *we build better foundry executives* and will prove it if you will send us the enrollment of a wide-awake chap to cooperate with us."

They Did Purchase an Enrollment and Wrote Us:

"Your course and service astonished us, as Mr. . . . . is now making a specialty of cylinder work of all descriptions—auto, marine, air, ammonia, steam and Diesel type oil cylinders, and chill castings, using from 20 to 50 per cent. steel with lower silicon mixtures in all work. We have found that these mixtures give a higher tensile strength and more uniform castings than the high silicon vanadium mixture used previously. Thru exhaustive tests we have discarded the use of vanadium unless called for on some special work.

"We now believe McLain's System has done more to re-establish engineering confidence in cupola metal than any other agency interested in the development of metallurgical processes."

Write for Free Information

McLAIN'S SYSTEM, INC.

700 Goldsmith Bldg.

MILWAUKEE, WIS.

McLain's System, Inc., 700 Goldsmith Bldg., Milwaukee, Wis.
I am interested in
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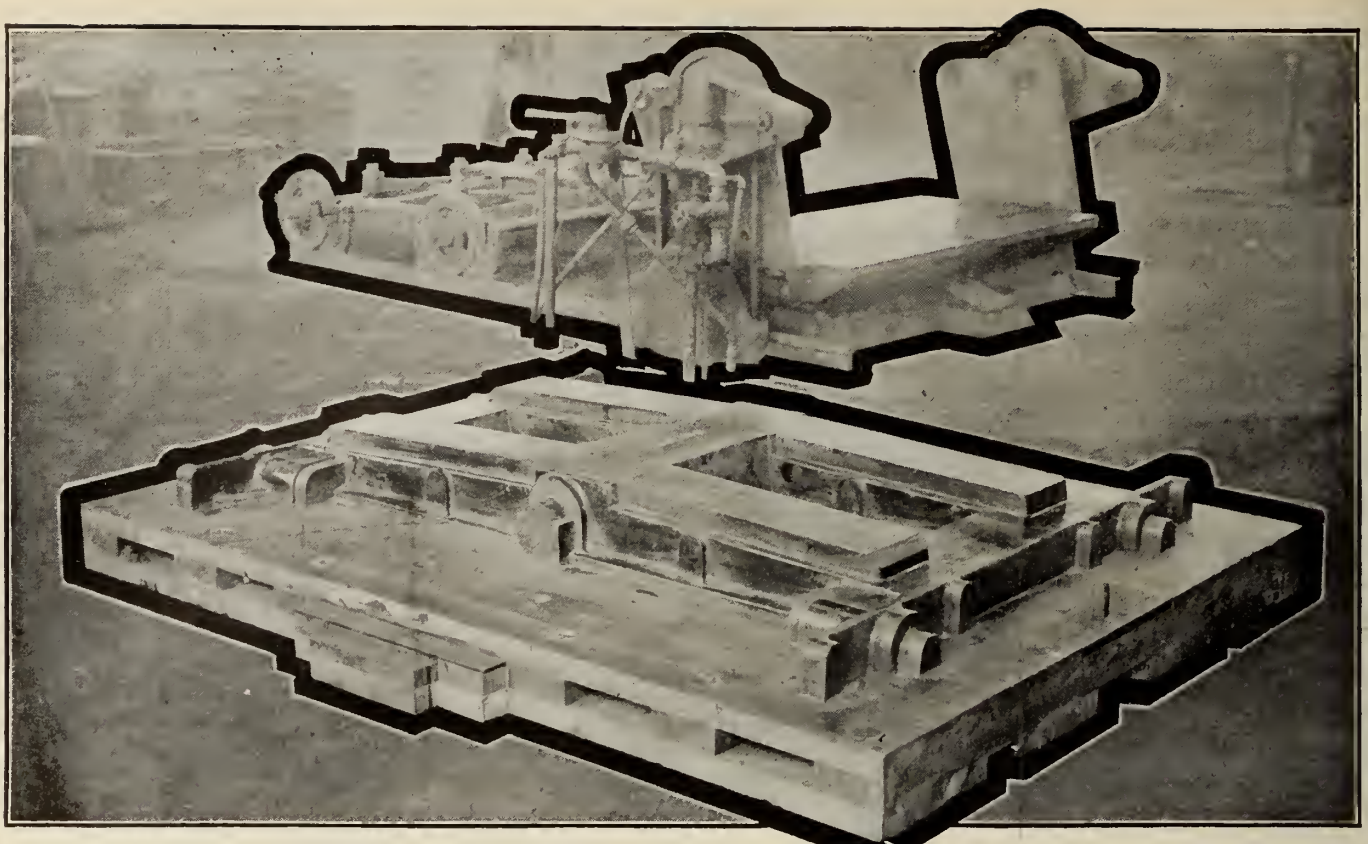
[ ] Crucible
[ ] Converter
[ ] Electric
[ ] Open Hearth
[ ] Semi-steel
[ ] Gray Iron
[ ] Blue Print Reading
[ ] Cupola Practice
Name .....
Address .....
Firm .....
Position .....
10-21.



Enforcing Jobbing Foundry Economies--

The buyer is wielding the whip on the backward foundry ---the foundry whose costs do not permit successful competitive bidding. Only those foundries can achieve a profitable volume which can meet their competitors on the bed-rock of greatest operating efficiency.

Osborn Moulding Machine practice permits a jobbing foundry to save a worth-while profit even on work taken at a figure which would leave no margin for a foundry operated on hand-moulding.

Facts---figures---and examples of actual production improvements are given in detail in our new foundry book, **"All in a Day's Work."**

On this 775 lb. casting a jobbing foundry pocketed the following savings as soon as it changed over to machine-moulding.

Flask size---66" x 49" x 8" high.

Before mounting---1 man put up 1 mould in 7 hours.

After mounting---4 men and 1 Osborn No. 405 Machine put up 20 moulds in 7 hours.

Labor required for moulding, coring, closing and pouring each mould:
Before---9 man-hours.
After---1 8-10 man-hours.

Cost of mounting pattern, including labor and materials $68.00.

Labor cost reduced 78 1-3 per cent.

Cost of pattern mounting saved on first 10 moulds.

THE OSBORN MANUFACTURING COMPANY

INCORPORATED

New York CLEVELAND San Francisco

OSBORN

MOULDING MACHINES

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

Member of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

A Nation of Farmers but with Foundries as Well

While The Farm Predominates in Canada, Our Other Industries Are Keeping Pace, Notably The Foundries, Some of Which Are Shown

AS a manufacturing nation, Canada makes no pretensions. We have a country here covering three and three quarter million square miles, or in other words two billion, four hundred million acres, and needless to say there are more people who earn their living on these millions of acres than at any other calling.

As an example of what the farmer is doing we might say that the crop acreage for this year is as follows;—Wheat 18,737,000 acres; Oats, 15,395,700 acres; Barley, 2,538,700 acres; Rye, 728,320 acres; Flax, 786,100 acres; Hay and Clover 10,534,200 acres, Potatoes 746,000 acres. This together with enormous herds of live stock and an abundance of fruits and vegetables is not bad from an agricultural stand-point. We are certainly not ashamed of our farmers.

A Nation of Farmers

I could go farther were I writing for an agricultural publication but will not proceed along this line other than to say that with all of this agricultural activity we, of necessity, have the industries which are required to keep up to the farmers' requirements. These industries in their turn draw others into the field, so that all told we have a big variety in our list of manufactories regardless of the fact that we are an agricultural people.

Mr. Thomas Findley, President of one of our big agricultural implement concerns, in an address at Winnipeg last fall had the following to say: "The first implement companies began operations between 1840 and 1850 and a few of them have been in continuous operation since that date. It woul be hard to conceive of any more natural line of manufacture for Canada than that of agricultural machinery. The development of agriculture and the making of agricultural implements have been very closely interwoven. Without the great advance in the design and manufacture of machines which has taken place during this period, agriculture on its present scale would have been quite impossible, and only the mechanical progress of the past forty years has made possible, agriculture as it is now carried on in Western Canada. Canadians, in proportion to their numbers, have had a very large share indeed in designing and perfecting farm machinery, as the patent records will show."

Over Zealous

In 1883 a tariff of thirty-five per cent was placed on farm implements with a view to encouraging Canadian manufacturers to build all the implements which were required in this country, and, considering the then limited agricultural area of Canada, an extraordinary number of companies entered into the manufacture of implements. For example, between the years 1886 and 1800, there were 19 different companies in the Province of Ontario alone, making binders, while at the same time there were only 9 companies in this line in the entire United States.

This was overdoing a good thing, it was a case where the tariff which was intended to help the manufacturers acted to the advantage of the consumer and drove some of the manufacturers out of business. The presence of so many companies caused a competition so bitter that most of them were in time forced to give up the struggle.

Comparatively few of these original companies survived but the industry is nevertheless, a very important one, having at the present time a capital investment of $93,255,000 and employing 31,000 hands, or in other words the little ones dropped out and the big ones got bigger. There are certainly more implements a good many times over made now than when we had so many smaller plants.

This only refers to the agricultural implement business, but in addition to this we have industries which supply most of our own requirements. It is, however, about our foundries that we are most particularly interested, and it is on this subject that I will continue my story.

SOME ARTICLES IN THIS ISSUE

A Nation of Farmers, but with Foundries 17
Showing views and describing a few of Canada's many foundries.

For the Man Who Works in the Foundry 26
How to make molds for cored work without using chaplets where they do harm.

Patterns and Castings 29
The foundry, its attractions and opportunities—The writer's views on how the foundry offers inducements not found elsewhere.

Producing Small Nonferrous Castings 30
Paper read at Foundrymen's Convention on making castings at the works of Yale and Towne.

Bronze Table from Boscoreale 32
A continuation of former article on antiquities from Mount Vesuvius.

The Foundry Letter Box 33
Wants information on sand for steel molding. Wants information on railroad brasses.

Carborundum Brass Furnace Lining . . 34
How carborundum is used for lining brass furnaces, either as a substitute for bricks or as an ally.

The Editorial Page 36
The question of strikes, conditions are as we make them — Canadian publishers handicapped — Boiler Scale Prevention.

Scraps from the Foundry Scrap Pile . 38
New foundries built, old one rebuilt—Obituary — Catalogues, and general foundry news.

Plating and Polishing 40
Practical articles, Useful data, Descriptions of Machinery equipment, etc., used in the plating and polishing industry.

Before proceeding with the subject of foundries it will be as well to point out that in addition to our grain and pasture fields, our snow capped mountains and our fish and game areas, for which the world sees fit to give us credit, we have, covering our three thousand mile stretch from the Atlantic to the Pacific no less than three trans-continental railroads, with a perfect net work of branch lines connecting up thousands of flourishing cities, towns and villages, among which we have some that can hold their place among the cities of the world.

Montreal with a population of 840,000 is one of the prominent cities of the world, while Toronto with a population of 560,000 is a city of no small importance. The names of Winnipeg, Vancouver, Halifax, Quebec and numerous other Canadian cities are familiar throughout the civilized world.

How Our Neighbors View Us.

However to get right down to business, if we are a nation of farmers we also have as many iron and brass foundries as any nation in the world in proportion to our population. How these foundries compare with those of other countries remains to be seen. In Toronto we have 64 foundries, some of which including all their departments employ between two and three thousand hands each. Montreal has 43 which also include some large ones. While Toronto and Montreal have more foundries than any of the smaller centers they do not make as good a showing in proportion to population as do some of the others. In Canada we have approximately six hundred foundries which are known as such, besides numerous small ones which have not made themselves known. To illustrate even the best of these would be the work of many months but that the reader may have an idea of what we have here in Canada I have selected a few of those with which I am the most familiar, so that I will be sure that I will not say anything about them that I cannot back up.

While most of these are in some way connected with the farming industry, there are obviously those which supply the wants of the city folk. The class of foundries which are being built of late years are of the most modern type and with all the latest of equipment and devices. Besides the new ones which are constantly being put into commission the older ones are being remodeled and equipped with modern devices, so that regardless of size our foundries are in as good a class as any in the world. Included in our foundry industries are some that are branches of American plants while some are the offshoots from British concerns but by far the greatest number are strictly Canadian, and among these latter ones are some of the biggest ones in the country.

It is amusing the views some people have of Canada. The little view taken from an American publication and here reproduced is one of the most amusing. I don't know where a view of this kind could be found in Canada, but in all probability it would be possible to find even worse if we tried. The locality where the American baloonists landed last winter would have made a nice illustration, but if those baloonists had landed in Death Valley or Dead Man's Cave or some other of the many possible landing places in their own country they might have fared even worse. There are punk spots in every country, but these same spots, while uninviting from some points of view are ideal from others. However as I have said, we have cities and manufacturing towns, and we are not ashamed of them any more than we are of our farms, and to back up this assertion I will show some of the foundries.

THE MASSEY-HARRIS COMPANY

To illustrate the different buildings which are included in those of this corporation would make a big publication in itself, but this is not necessary as manufacturing establishments have a similarity of appearance which would get monotonous if over-done. The illustration here shown is only one corner of one of the plants.

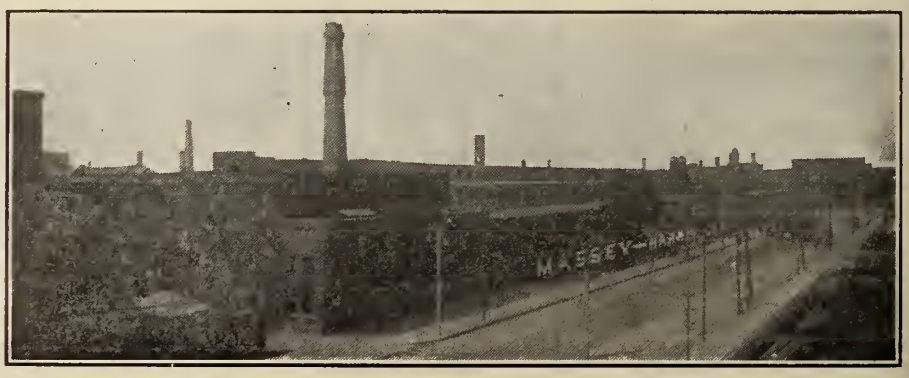
The Massey-Harris Co., is one of Canada's leading institutions and includes the head office and plant at Toronto, formerly known as the Massey Mfg, Co.; the plant at Brantford, formerly known as the A. Harris & Son Co., the Verity Plow Works at Brantford, and the Bain Wagon Works at Woodstock. They also have a plant at Weston and are connected with the Sawyer-Massey Works at Hamilton, Ont.

All of the plants are strictly Canadian, having started on a small scale and worked up to their present enormous dimensions. The two big plants, the Toronto and Brantford ones, were both started in small towns and grew up in opposition to each other until wisdom dictated that in union was strength, and that the farmer could be better served by one organization.

The Massey works was established at Newmarket, Ont., in the year 1847, while the Harris plant was established about the same time at Beamsville, Ont. After becoming of sufficient importance to require the advantage of the city they moved to the above mentioned cities and continued to grow year by year. Some twenty-five years ago they were amalgamated into the Massey-Harris Company, Limited, and have since rearranged their work so that each plant is devoted to a certain line of work.

Looking down the gangway in one room of foundry, Massey-Harris works, Toronto branch.

The illustration shown is the molding department of the Toronto plant. I am taking it for granted that the reader understands that this company is strictly in the farm implement business, in all of their plants and to show an interior view of one end of the molding shop The reader will see that it is like looking down a street. Fire walls are built at intervals, so that this view is only one section of the floor. The view in front of the spout will convey some idea of how the iron is delivered to the men. The stream from the cupola would be too much for even those molders who work close to the cupola. The metal is run into bogy ladles and shoved along the overhead trolley track to the most



Foundry department only. Massey-Marris Co., Toronto, Ont.

remote part of the foundry. The dimensions of this foundry will be of interest. The foundry proper is 528 feet long and 95 feet wide. With the core department at one end and the cleaning department at the other, the length of the combined building is 913 feet,—about three city blocks. One section of the foundry has rather a unique feature—a basement for the storage of sand and other materials, and a travelling conveyor delivers this material to any point desired.

The melting equipment consists of four cupolas, each having an inside diameter of 96 inches, and with a melting capacity of 25 tons per hour, giving a total melting capacity of 100 tons per hour, although under ordinary conditions only two are used while the remaining two are being put in shape.

The iron and fuel are loaded on small cars, raised to the charging floor on electric elevators, and by means of transfer tables can be brought to the cupola as required, and the contents are deposited in the cupola by means of a pneumatic dump. The blower for each cupola is a separate unit operated by an individual electric motor.

The molding, as might be expected, is done extensively by molding machines, and the cleaning department is equipped with tumbling mills and sand blast.

The core department ocupies a fireproof building 97½ by 100 ft. with three stories and basement. The basement is used for storing sand and other supplies; the main floor for making the cores, and the upper floors for storage of cores and other articles. An elevator carries sand from the basement to a sand mixer on the top floor from where it is distributed by conveyors to the various tiers of benches in the core room.

Altogether it would be hard to find a more complete and up-to-date foundry than this.

The other departments are in proportionate sizes and fully equipped. When running to capacity 2,700 hands are employed at this plant.

Brantford is a typical manufacturing city with a foundry on almost every

How the metal is delivered to the men in the next block. Note the bogy ladles and overhead trolley system.

street, all built on a large scale, and here the Harris branch of the Massey-Harris company is located. This plant employs normally about 1,500 men and specializes on mowers, binders and trussers. Mowers being bulky and made almost entirely of cast iron, more iron is melted at this plant than at the Toronto plant in proportion to its size. The floor space in the foundry is 35,000 square feet while that of the core room is about 4.000. The equipment of this plant is complete. In the foundry, practically all patterns have been fitted to machines or match plates. The cleaning room is especially well provided for. A very complete and efficient exhaust system keeps the air pure and healthy. In addition to the usual tumbling mills, a New Haven sand blast machine is used for cleaning the finer gears.

Formerly ninety molders, each presiding over a floor, were required to keep the works supplied, but with modern equipment each man requires more space, and from 70 to 80 molders fill the shop.

The Verity Plow Works

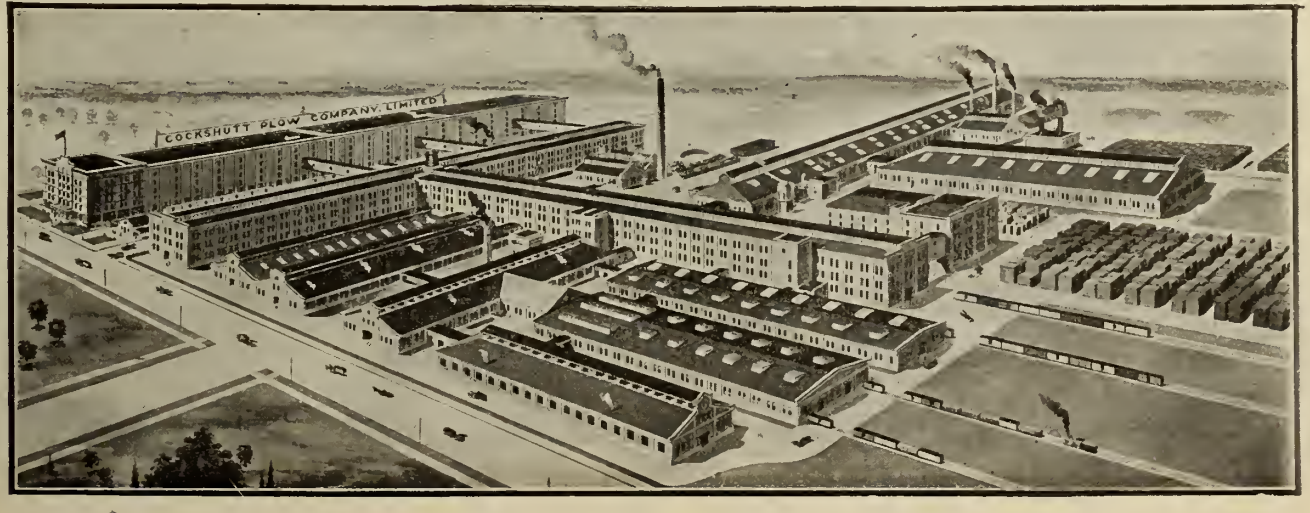
The Verity Plow Company started in a small way at Exeter, Ont., and grew until a modern city plant was required. Their present plant at Brantford is a model of perfection, employing some six hundred men, manufacturing plows. They have recently been absorbed by the Massey-Harris Co.

COCKSHUTT PLOW COMPANY, LTD.

From the foregoing it will be seen that side by side with the expansion of Canada's agricultural industry has grown the great industry of manufacturing machinery an implements for farming purposes. In many cases indeed, the latter has pioneered the way for the former. This is the case with the Cockshutt Plow Company Limited. This great company which owns one of the largest implement factories in Canada has not only kept well abreast of agricultural development but in a score of ways has stimulated it. Its inventive genius has designed and its skilled workmen have made machinery and implements which have enabled the farmer to turn to profitable use many fields previously unworked. Throughout its existence the Cockshutt Plow Company has devoted itself to a study of the difficulties confronting the farmer and as a result of the study it has been able to place in his hands the means of utilizing to the full almost every class of land. Not one but dozens of different implements have been made to meet varying conditions and on no occasion when the land has called for a machine or implement of special design to overcome special conditions has the Cockshutt Plow Company failed to supply what was required.

It built its reputation on Plows that would and do plow every class of land. It is maintaining that reputation and has enhanced it by the production of implements for other phases of cultivation. For 44 years it has made Plows that have very few equals and today its immense works at Brantford, Ontario, are an evidence of the success which it has achieved, not alone in the Dominion but throughout the world.

The original factory, a small and unpretentious affair, was erected in 1877 by the late James G. Cockshutt, who had with him five employees. He started out to manufacture plows only, and did it with such success that the fame of his products increased with each succeeding year. In 1882 his business



Works of The Cockshutt Plow Company. Brantford, Ont.

was taken over by an incorporated company of which he was the presiding head, and launched out on a career of unparalleled development. Year by year the fame of the Cockshutt plow spread. Time after time the factory was increased, or pulled down and rebuilt as best could be done without interfering with the output. In 1896 it was decided to rebuild again, tearing down the factory piece by piece, and establishing a plant that would fulfil the company's requirements indefinitely. This work was carried on for two or three seasons, and in 1898 it was completed. Then came the period of Canada's greatest agricultural development, and before a few more seasons had passed the Cockshutt Company found itself crowded out by orders. It was at first intended to go on rebuilding, but on this occasion the press of business rendered that impossible. The directors then decided to erect an entirely new factory in a section of the city where perfect facilities could be secured, and where there would be sufficient land for all purposes. The new site was admirably chosen. It comprised 35 acres of land on the Mohawk Road with ample room for extension. Under normal conditions the plant employs about 900 men. Before building, the Company's architects and factory experts went all over America, inspecting plow plants and machinery factories, and the best ideas were incorporated in the plans. On these were built the most modern and complete implement works that skilled minds could devise. The factory is an imposing building of pressed brick, and in it is installed the finest plant that money could buy or skill produce. They comprise in their design and equipment every detail that makes for economy, efficiency, and expedition in production.

Although the company has established itself on the reputation of its plows, it has for years past catered to the demand for all classes of machinery, and from the list of its many and varied manufactures, or the products for which it is selling agent, may be taken the following: binders, reapers, mowers, rakes, hayloaders, drills, cultivators, seeders, disc and drag harrows, manure spreaders, weeders, scufflers, planters, riding plows, slicers, tractor plows, pulpers, walking plows, barrows, wagons, sleighs, carriages, carts, gasoline engines, etc. There is no better known farming implement than the Cockshutt Company's tractor plow, which is to be found all over the world wherever tractors are employed. The Company is selling agent for the Frost & Wood Company's products in the territory of Canada West and North of Peterborough There are Cockshutt branches and warehouses in Winnipeg, Regina, Calgary, Edmonton and Saskatoon, and distributing warehouses in Red Deer, Lethbridge, Brandon and Portage la Prairie. In these are carried immense stocks of all classes of implements and farm machinery, and the Company is in constant touch with every requirement of the agriculturist, through the medium of its splendid sales and agencies departments. All over the world agencies and depots have been established and Cockshutt products are sold largely in South Africa, South America, Great Britain, Australia, New Zealand, Spain, Syria—in fact everywhere. In this company Canada possesses a native industry that has been built up on sound, honest lines, and one of which the Dominion may well be proud.

THE INTERNATIONAL HARVESTER COMPANY

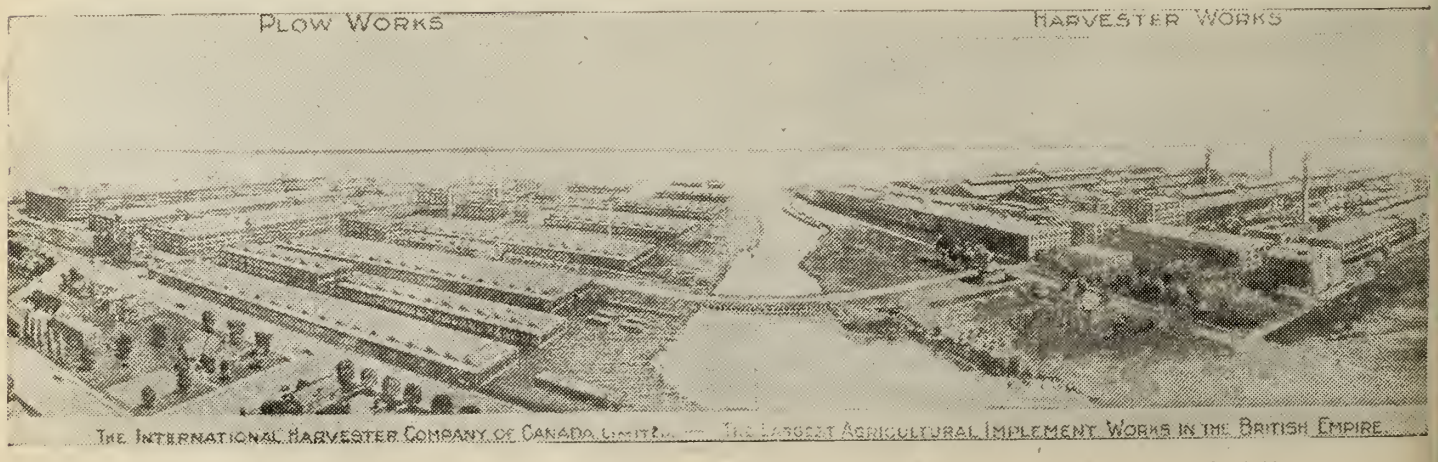
The International Harvester Company of Canada, as its name implies, is a member of the family of International plants some of which are American but one of which is Canadian. This plant is located at Hamilton, Ont., and has sixteen branches throughout Canada where implements are carried in stock. The Hamilton plant as will be seen includes what was formerly the Oliver Plow works but which is now a part of the International. This great corporation would not have located in Canada and continued to add to their capacity year after year if business had not warranted it. Their plant as it now stands has a floor area of 1,533,069 square feet. This, of course includes their different departments, but the foundry departments alone have an area of nearly four hundred thousand square feet. As will be understood, agricultural implements as they are built today, do not call for the proportion of cast iron that was formerly used—steel and malleable iron making up a big percentage of the tonnage, but gray iron is still used to an enormous extent when the number of machines is taken into consideration. This company make their own malleable and have a malleable foundry almost as big as the grey-iron foundry. The combined area of the two gray iron foundries, which includes that of the plow works, is 205,000 square feet,while that of the malleable foundry is 103,600 square feet. Under ordinary conditions three thousand hands are employed. An idea of the volume of business carried on will be grasped, from the amount of material used. In a normal year this plant consumes 10,000,000 feet of lumber, 22,000 tons of steel 10,000 tons of pig iron and 500 tons of paint.

There are two cafeterias in the plant where meals are provided at cost for employees. Everything in the way of shower baths and comforts for the men is provided.

Th arrangements whereby the men are kept from being dissatisfied and incidentally whereby strikes are avoided is perhaps the most interesting feature in connection with the plant. From the Organization are chosen Safety Committees, who together with Safety Inspectors see that everything possible is done to safeguard the employees from accident.

The Plant is operated under the Harvester Works Council plan. The Council is composed of a number of men appointed by the Management, and a like number of employe representatives elected by the employees. At these Councils the employees' representatives have an equal say with the Management representatives on working conditions, hours of labor, education, health, wages, safety, recreation, and other matters of mutual interest. Every employee is guaranteed the right to present any suggestions, requests or complaints, with the assurance that they will be promptly considered.

All told the International Harvester works is a plant which while depending on the farms for its existence, gives employment directly and indirectly to a sufficient number of Canadians to make up a good sized city.


PLOW WORKS
HARVESTER WORKS
THE INTERNATIONAL HARVESTER COMPANY OF CANADA, LIMITED
THE LARGEST AGRICULTURAL IMPLEMENT WORKS IN THE BRITISH EMPIRE

The International Harvester Works and The Oliver Plow Works which were recently incorporated into one organization. The bridge over the stream connects the two plants.

THE CANADIAN LOCOMOTIVE WORKS

The Canadian Locomotive Company, Kingston, Ont., is an institution of which Canada is justly proud. A locomotive is certainly not an agricultural contrivance, but from a Canadian standpoint it is undoubtedly called upon to serve the farmer, more than any one else. The vast wheat fields of Canada would be of little value without the assistance of the locomotive to draw the grain to different parts of the continent and to the docks for export. Canada's railroad mileage as we have already shown runs far into the thousands and many locomotives are required. These locomotives are made right here in Canada and what is probably the pioneer of all our locomotive plants is the one here shown.

The Canadian Locomotive Co. started business in the year 1850, and while considerably smaller than at present, it was, of necessity, a good sized plant to begin with, as locomotives can not well be made in small shops. It has been successfully operated under various managements right up to the present day. The view of the plant here shown gives a good idea of its extent at the present time. This of course includes the machine shop, boiler shop, smithy, etc., but all the iron and brass castings which go to make up the output of the plant are made in the company's own foundry which is included in the view shown.

The company is Canadian from the ground up and the names of the directors and executive give a guarantee of sound business-like management.

The names of the directors are:— Aemilius Jarvis, Esq., Robert Hobson, Esq., Warren Y. Soper, Esq., John L. Whiting, K.C., James Carruthers, Esq., M. J. Haney, C.E., F. A. Wallace, Esq., Wm. Casey, Esq., Wm. Harty, Jr., Esq.

The executive officers are F. G. Wallace, President; John L. Whiting, Vice-President; Wm. Casey, 2nd Vice-President and general manager; Aemilius Jarvis, chairman of the board; Wm. Harty, secretary and sales manager; J. H. Birkett, treasurer.

The product of the company includes all kinds of steam locomotives for passenger, freight and switching service, both for domestic, foreign and industrial works.

Locomotives recently built for the Canadian roads include "Pacific Type" 23½ x 28 inch cylinders, 73 inch driving wheels and weighing 249,500 lbs., in working order. "Mikado Type" 27 x 30 inch cylinders, 63 inch driving wheels, 280,800 lbs. in working order. "Switching Type" 26 x 30 inch cylinders, 56 inch driving wheels, 242,750 lbs., in working order.

Orders recently filled for foreign service include "Decapol" type, for the Russian Government, 21 x 28 inch cylinders, 56 inch driving wheels, 159,000 lbs., in working order. "Consolidation" type, for the British Government, 21 x 28 inch cylinders, 58 inch driving wheels, 159,000 lbs., in working order.

Twelve wheel type, for Jamaica Government Railways, 19 x 26 inch cylinders, 46 inch driving wheels, 137,500 lbs. in working order.

THE GRINNELL FOUNDRY

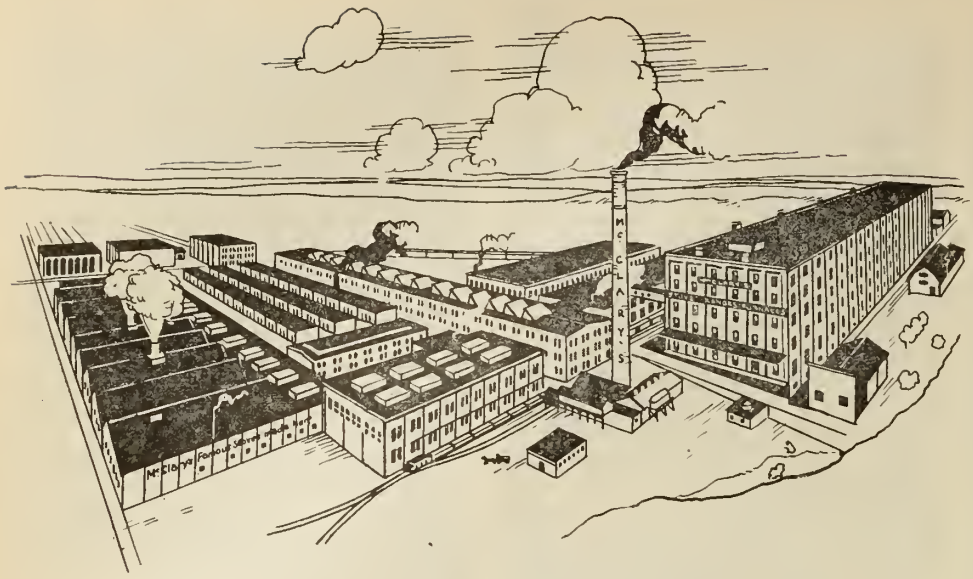
This is a typical American plant located in Canada, but it was located here on account of the enormous amount of material which they were shipping into this country from the united States. Before building their foundry in Toronto they had a machine shop and store room, and filled their Canadian orders with imported castings. They had every opportunity to learn what was before them and they knew exactly what they were at when they built this enormous foundry, with every known device for the production of the one line which they manufacture. The specialty for which they are more familiarly noted is that of sprinkling systems for fire extinguishers, but this is mostly pipe and non-ferrous castings which do not come from the foundry. The foundry produces the pipe fittings only, and is fitted on purpose for this work. This foundry has been so thoroughly reviewed in late issues of this paper that further material on the subject is unnecessary, but it will be interesting to the reader to know that the farmer is the most extensive buyer of this class of goods. Every up-to-date farmer has his stable fitted with a water system so that his stock is as comfortably provided for as the farmer himself. A trip over any country road reveals windmill towers in almost every farm yard. This means that the farmer has a force pump and an overhead tank which supplies lawn sprinklers, household water supply, fire protection, and every other use to which water is to be put. This all calls for pipe fittings and helps to keep the foundry business going.

THE McCLARY MANUFACTURING COMPANY

The McClary Mfg. Co., is an institution which we think can be truthfully called one hundred per cent Canadian. In the year 1847 John McClary began his apprenticeship as a tinsmith in a small tinshop in what is now the city of London, Ont., being then 18 years of age and without experience or ability of any kind. Three years later he associated himself with his brother Oliver and began business under the firm of J. & O. McClary. Tinware was of course their line.

In those days there were no railroads and for that matter few roads of any kind which were of use for more than a portion of the year. The population was also very sparse, and the demand for tinware insufficient for a very large business and as a consequence plows were added to their line, the castings being brought from a small foundry which was located in London.

Works of The Canadian Locomotive Company, Kingston, Ont.



Stove foundry department of the McClary Manufacturing Company, London, Ont.

While the demand for plows was brisk the outlook did not appear very bright, so the plow business was abandoned, the little foundry purchased and added to the business and the manufacture of stoves began.

In 1853 the Great Western Railroad was built through London, thus opening up a bigger field for the sale of stoves, and changing the system from peddling to supplying the goods through dealers in the different localities.

In 1879 their first branch warehouse was built in Toronto, and in 1880 a second one in Montreal to be followed by one in Winnipeg. Each year brought increased business and in 1894 a branch was built at Vancouver, one at St.John N.B. in 1901, and one at Hamilton in 1902. In 1909 branches were built at Calgary and Saskatoon and in 1910 one was built at Edmonton.

Needless to say, this enormous business could not be carried on without increasing the plant at London. Years ago the buildings covered every inch of space on the ground, and the entire plant was turned over to the manufacture of enamelware and other lines which the company manufactures, and an entire new stove foundry built in a different part of the city.

The remarkable development and rise of McClary's would form a very interesting chapter in any written history of the industrial progress of Canada. To John McClary himself must be given the largest share of the honor since it has been due to his outstanding personality and unusual business foresight that McClary's stand to-day in the unique and proud position of the largest manufacturers of stoves and ranges in the Empire.

The extension of the business from one small building to its present fifteen acres has, as we have seen, not been the result of mushroom growth or of wild speculation.

Eighteen years of age in 1847 does not find Mr. McClary a very young man now, but he is still hale and hearty. His brother Oliver died many years ago.

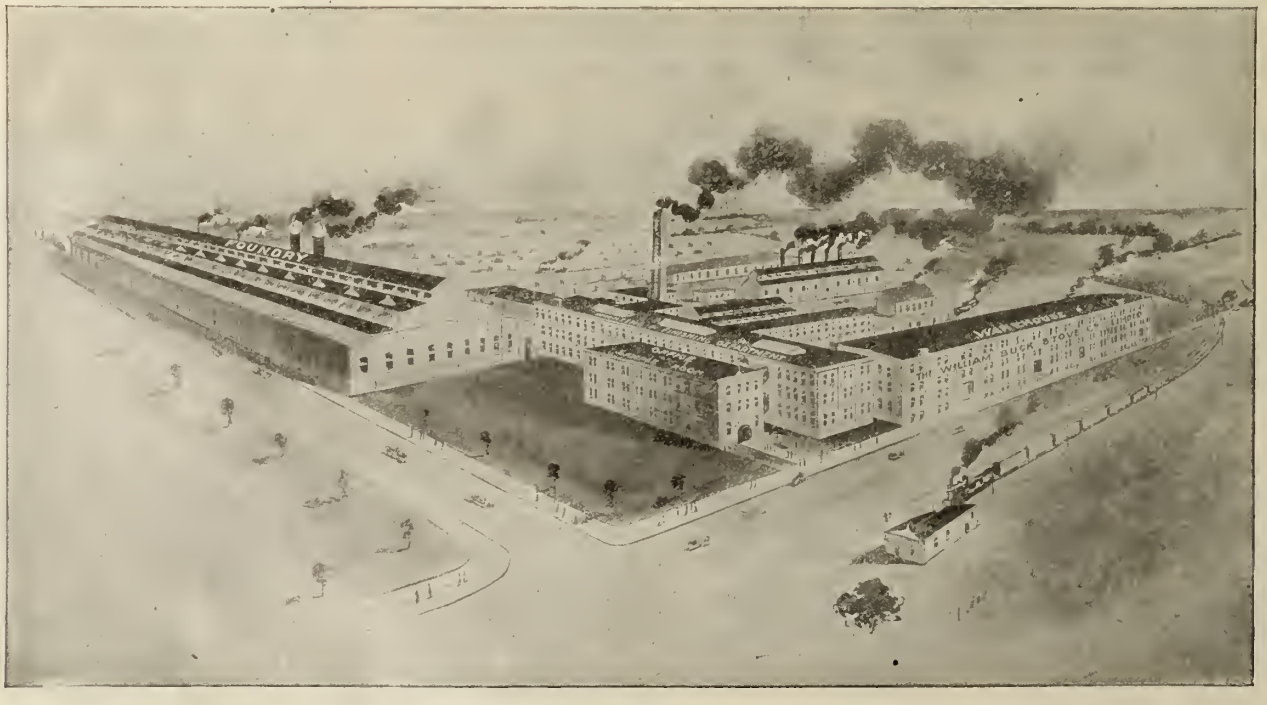
In 1876 Mr. W. M. Gartshore became identified with the company, and his proven ability has done much toward the success of the business.

In 1907, sixty years from the time when Mr. McClary began his apprenticeship all the firm's employees assembled in London to do him honor. They came from the far West and the far East. Managers, office staffs, and salesmen from every outpost of the company.

McClary's of course cater to the farmers as well as to the rest of us.

THE HAPPY THOUGHT FOUNDRY CO.

The Happy Thought Foundry Co., is another strictly Canadian concern; is located at Brantford, Ont., and is amongst the pioneers in Canadian foundry business. This foundry was started over sixty years ago in a very small way by the late Wm. Buck, and like many of the foundries of those days made practically everything which could be made of cast iron. Mr. Buck was not many years in building up a big business calling for much bigger and better buildings. These were built on Brant Ave. and covered the better part of the entire block; being known as the Victoria Foundry. Mr. Buck died about thirty years ago leaving a well established business manufacturing stoves, ranges and furnaces, to his three sons who reorganized under the name of The Wm. Buck Stove Co. Limited. About eighteen years ago they abandon-



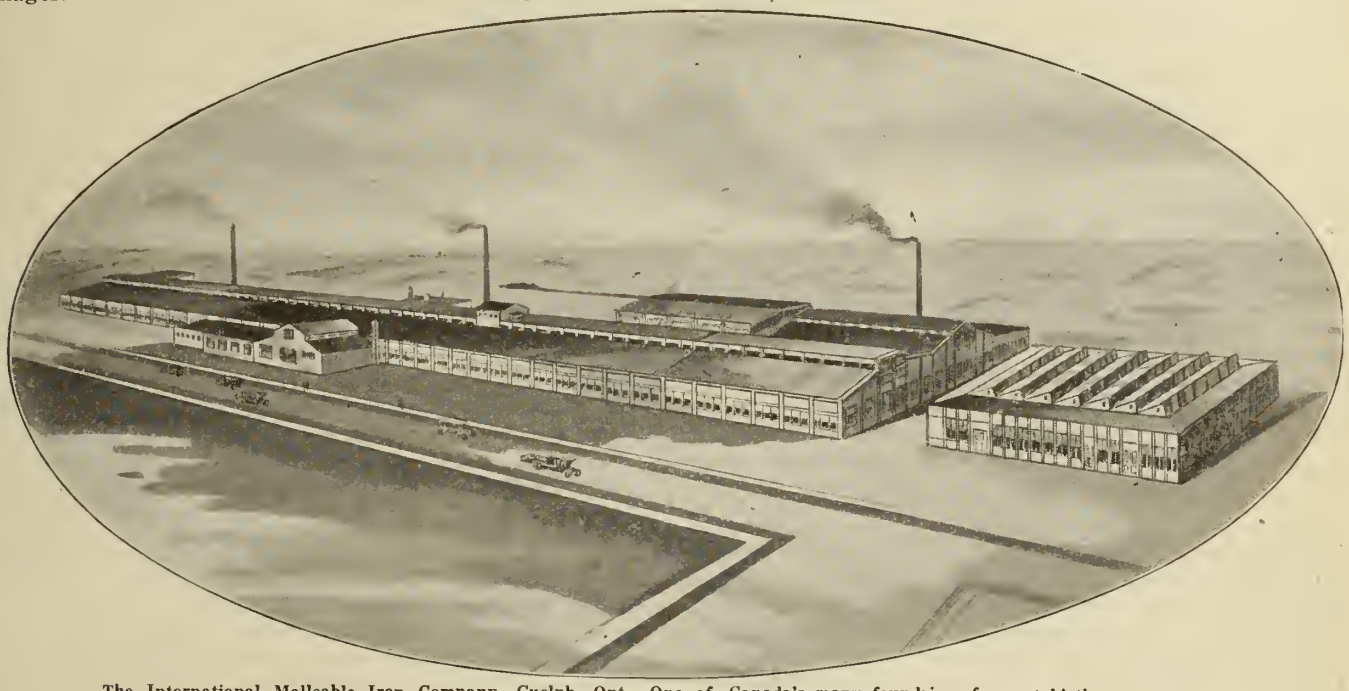
Works of The Happy Thought Foundry Company, Brantford, Ont.

ed the old plant which had served so many years and built the enormous plant shown in the illustration. About a year ago another reorganization took place and a new charter was secured under the name of The Happy Thought Foundry Co., Ltd. Many improvements were made and additions not shown in the illustration but which did not materially change the appearance were added. This foundry has 135 floors and everything else which is required to keep up to a foundry of this size. The entire floor space is concrete and every moulder is provided with a locker. Lunch counter, baths and all modern comforts for the employees is included. The name "Happy Thought" so long connected with Buck's ranges had become even more familiar than the name of the owners, hence the name of the corporation. Mr. W. W. Nobbs is the manager.

power plant buildings and the annealing room. Each year found the buildings and equipment inadequate for the demands made upon them and additional facilities were accordingly added until last year a two hundred foot addition was added to the molding shop, making it 650 feet in length. A proportionate addition was added to the annealing room and more annealing ovens installed. An entire new brick machine shop, equipped with all the latest devices for tapping, drilling, facing, etc., was built. The former machine shop being remodelled into a modern pattern-making shop with fire-proof pattern vault. A new office was also built.

The melting equipment of the plant consists of forced draught reverberatory furnaces all connected to one chimney. The power for driving the plant is electricity, produced by their own steam plant which derives its heat from the fuel of the melting furnaces after it has done its duty in the furnaces. This is said to be more economical than buying power from any power company and also more reliable. In addition to the reverberatory malleable furnaces there is also a cupola for the melting of gray iron, which is required for the cast fittings and other iron castings manufactured by the company. From this it will be seen that they are fully equipped for malleable and grey iron castings. They manufacture a complete line of pipe-fittings, detachable link chain, silo lugs, clevises, etc. They also do a general line of jobbing castings such as farm implement castings, motor car and railroad work.

The directorate of the company is partly composed of directors of the Illinois Malleable Iron Company and partly local men. H. E. Bullock, President of the Illinois Malleable Iron Co., and W. J. Akin, Vice-President and Treasurer of the same, are holding similar positions in this company, while W. H. Burgess is Vice-President and General Manager.



The International Malleable Iron Company, Guelph, Ont. One of Canada's many foundries of recent birth.

INTERNATIONAL MALLEABLE IRON COMPANY

The International Malleable Iron Co., Limited, Guelph, Ont., is an institution of which Canada may well be proud. This is an offspring of the Illinois Malleable Iron Co. and has been in operation since 1913. It was not a small plant to begin with but it was much smaller than today. Each year has seen additions and improvements added until it is at present one of the most complete malleable iron foundries on the continent.

In July, 1913, this newly organized Canadian Corporation began operations on what had previously been a vacant field on the outskirts of the city of Guelph. Now that entire district is covered with foundries and factories of different kinds. The original buildings included a foundry department four hundred and fifty feet in length; a two story building which housed the machine shop on the first floor and the pattern and general wood-working department upstairs. In addition to these were the

THE CANADA MACHINERY CORPORATION

The Canada Machinery Corporation, Galt, Ont., whose works are here shown, are operating what is really more of a machine shop than a foundry, but their foundry department is one of the most modern on the continent. The site on which it is built is ideal for a foundry doing the class of work done here. The land at the rear is at quite an elevation above that at the front, and the city street runs in front while the Grand Trunk tracks are at the rear on the high level. The foundry is built in the side of this hill so as to have the charging floor of the cupola on a level with the railroad track and the foundry floor on a level with the street. All the coke and iron is taken from the cars and stored on the high level while sand and such supplies as are for use in the molding department are discharged from the cars into chutes leading to bins on the lower level where they are free from frost and handy to the foundry. The McGregor-Gourlay Company, the original owners of the plant were established in the year 1868, but the present company, which is an amalgamation of the McGregor-Gourlay Company, London Machine Tool Company, Sussex Manufacturing Company, John Ballantine Company and the Hespeler Machinery Company was organised in 1910 as the Canada Machinery Corporation. The Hespeler factory is still in operation making wood-working machinery exclusively, although getting their castings from the Galt works. The output of the Galt works consists of machine tools, such as lathes, planers, shapers, slotters, presses, drills, etc., also a complete line of wood-working machinery embodying practically all

Galt plant of Canada Machinery Corporation, Limited, Galt, Ont.

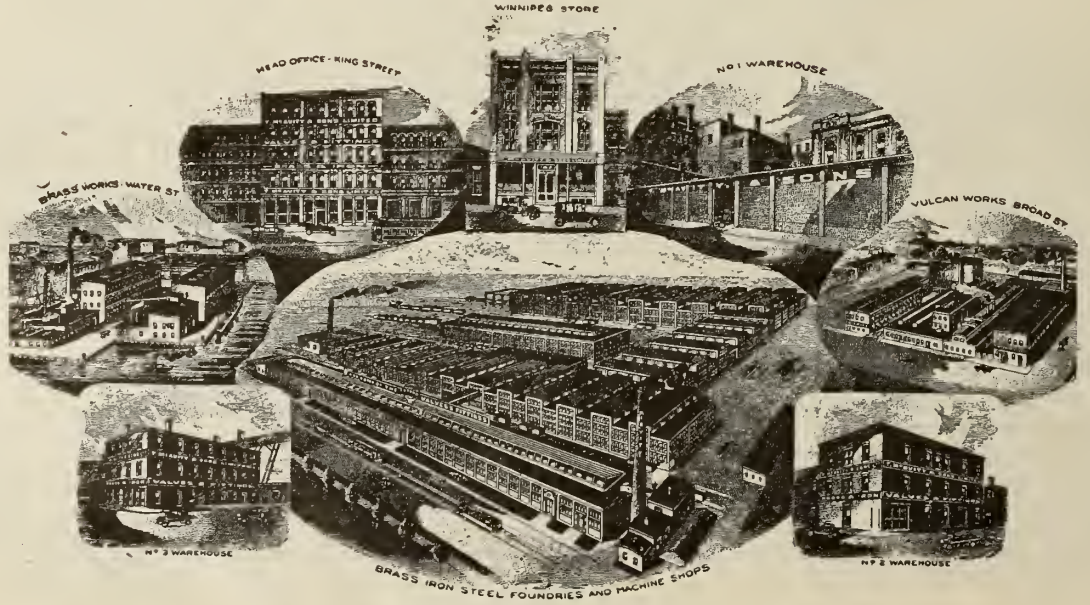
machines required for the finished dressing of hard and soft wood, such as planers and matchers, surfacers, moulders, sanders, tenoning and mortising machines, band-saws, re-saws, rip-saws, cross cut saws and boring machines. They also contract on special heavy machinery. They operate a large well equipped pattern shop and make all their own patterns. The foundry is equipped to handle castings weighing up to twenty-five ton, and during normal times they can attain a monthly output of three hundred ton. Electric travelling cranes, powerful jolting mashines and other modern devices are in evidence. Under normal conditions they employ five hundred hands.

T. McAVITY & SONS

T. McAvity & Sons, St. John, N.B., is an establishment which can be truthfully termed one hundred per cent Canadian. The birth of this well-known firm—the advent of a business which was to mean so much to St. John and Canada in succeeding years, giving employment to over 2,500 employees in various branches, dates back to 1834, succeeding the hardware and general store business of James Hendricks.

Thomas McAvity, when a youth of twelve years became an indented apprentice to James Hendricks, hardware merchant, North Market Wharf, to learn the "art, trade and mystery" of an ironmonger, as was the custom at that time for all lads who desired to learn a business. He served his apprenticeship of seven years and remained in Mr. Hendricks' employ until 1834 when he started business for himself under the style of Thomas McAvity & Co. A few years later he bought out the Hendricks business and incorporated it with his own. In 1854 the firm name was changed to J. & T. McAvity, and in 1873 it became T. McAvity & Sons. In 1907 the firm was incorporated under the name of T. McAvity & Sons, Limited. Thus it will be seen that the persistent energy of generation after generation of Canadian-born McAvitys has succeeded in building up a business which is surpassed by few on the continent of America.

Their early career, while successful, was purely mercantile, and it was not until the year 1863 that they launched into the foundry business. In that year they bought out a small brass foundry employing some 14 hands, doing ship work, bells, rudder braces, roller bushes, etc. They soon required larger buildings which were secured when they added small brass work and cocks to their line of ship work. In 1877 their plant was destroyed by fire which devastated the entire city. Temporary buildings were immediately erected and business resumed. In 1879 they began the manufacture of valves. In 1882 they moved into a new building and specialized on all kinds of brass work for shipbuilders', railway, locomotive, pulp mills, engineers' and steamfitters' use. With the idea of consolidating their brass and iron foundries and machine shops on one site they began in April, 1916, the erection of their present plant. This extensive plant occupies twenty-eight acres of land, and with its eight spur lines connecting with the main lines of the different railways, gives them the manufacturing and shipping facilities required to keep up with the increasing demand for their goods. A new foundry for the manufacture of pipe is in contemplation, and a new malleable iron, foundry, new steel foundry and additional brass foundry space is being seriously considered. During the war this company brushed aside most of their regular line of work and went in extensively to the shell business being among the first and most extensive producers of high explosive shells, but since the war they are down to business in their regular lines again. One line omitted in the list mentioned is that of acid-resiting bronze valves and fittings for pulp, paper, and sulphite mills. Another interesting contract filled by this company was that of the bronze posts which mark the boundary between Alaska and British Columbia. Some of these posts are on the highest peaks of the Rockies.


WINNIPEG STORE
HEAD OFFICE - KING STREET
NO 1 WAREHOUSE
BRASS WORKS - WATER ST
VULCAN WORKS BROAD ST
No 3 WAREHOUSE
No 2 WAREHOUSE
BRASS IRON STEEL FOUNDRIES AND MACHINE SHOPS

Different Departments of T. McAvity & Sons, S. John, N.B.

Operating the Foundry Cupola

Properly Managed Cupola the Most Essential Feature In the Foundry — How to Begin Operations

THE following paper on operating the cupola, was prepared by The American Foundry Equipment Manufacturers' Association and if carefully followed will be a guide for foremen and melters, who are not properly posted on the subject.

The cupola is the starting point in a gray iron foundry and if not properly managed will cause more trouble and anxiety than any other part of your equipment. A summary of the most approved methods of caring for and operating the cupola will be presented in this and two succeeding papers.

The first thing to be done in the morning by the cupola tender is to clear away the dump of coke, iron and slag. After this is done, if the cupola is cool enough and not too badly bunged up, go inside with a pick and clean it out. Be very careful not to break any scale that may have formed on the brick lining, or damage brick with pick. It is better to leave some of the slag, etc., on brick than to clean it so close as to damage the lining.

Daubing is the next thing to do after the cupola has been cleaned out. It should be put on sparingly; far better to put on from ½ to 3 inches and have it stay on than from 3 to 6 inches which invariably will "bag down" over the tuyeres, causing no end of trouble, besides leaving the brick at the melting point, as if no daubing had been put on. Should you find it necessary to fill up any deep holes that may have burned out, use brick bats with just enough daubing to hold them in place. However, it is not necessary, as some may think, to keep the lining straight inside. Bear in mind that all cupolas will melt much better when they have formed a belly by burning out at the melting point, of from 2 to 6 inches, according to the size of cupala and thickness of brick lining. Always use the best brick that can be procured to line cupolas from bottom to the charging doors regardless of first cost—it will save you money. This also applies to cupola daubing. The next important item is placing the sand bottom and the material used. Gather up the finer material that has been left from the dump of cupola, put it through a ¼-inch riddle; if dry, wet it with thin clay wash until it is about the same consistency as moulding sand. If already damp enough, use about 4 shovels of new molding sand to each wheel barrow full.

Sand bottoms will scab, and sometimes cut through, if they are too wet or rammed too hard. Cupolas from 24 to 36 inches inside diameter should have 3 inches of sand bottom in front and 3½ inches at the back; those from 36 to 48 should have 3½ inches in front to 4½ at the back; 48 to 60 inches inside, 4 inches in front and 5 inches at the back; 60 to 72 inches inside, 4½ inches in front and 5¾ inches at the back; 72 to 84 inches inside, 5½ inches in front and 6½ inches at the back. After sand bottom has once been placed it is an easy matter to keep these heights without measure because the line of former sand bottom will show on the brick lining. When sand bottom has been well rammed, take a stick or short straight edge and strike it off so there will be no uneven spots, but still retain the slope from back to front.

A little new sand, mixed with clay wash, should be used in the sand bottom near the tap hole. Use clay mixed with sharp sand for daubing the spout. It should be mixed in proportions that will prevent cracking.

Putting in the breast is a very particular part in connection with the care of a cupola. There are many different ideas as to how this should be done. One of the most approved methods is to put in one half of it before starting the fire. This will give the portion around the tap hole a chance to become thoroughly dry before the wind is put on. It also will leave an opening for draught which very materially will aid the fire to burn. The breast should not be over 3 inches thick at the tap hole. To provide for such a contingency as the tap hole becoming bunged up during the heat with slag or dull iron, some melters are accustomed to putting in a second tap hole about 2 inches above the first. This can be done by using a round core of the proper size three or four inches long which should be covered with clay on the outside to prevent it from burning through and blowing out during the heat. However, it is much better to cultivate good furnace practice so that this precaution will not be necessary. In stove foundries and others where the stream runs continuously, of course, this precaution is not necessary.

Use plenty of shavings and kindling wood so that the coke will ignite readily and thoroughly. Oil is sometimes used instead of shavings and the practice of lighting the fire with an oil burner pressure torch is steadily gaining in favor. Put the bed of fuel on before lighting the fire, reserving one or two bushels to level the bed before charging the iron. Allow the bed to burn until the blue flame shows up well, then level the bed up with the remaining fuel. The cupola is then ready to charge. Iron should be charged with care so that it will pack closely, thereby confining the heat; always bear in mind that it is the heat under the iron that does the work. Continue the charging of the coke and iron, keeping each charge of fuel as level as possible and iron charged closely until the bottom of the charging door has been reached. The blast can then be put on if necessary but it is better to allow the iron to heat up thoroughly, it will assure more rapid melting. Charges can be left in cupola several hours without the bed burning out if the tuyeres and front are closed. Just before putting on the wind take material about the same consistency as the stopping clay and put it in the remainder of the breast. There are a number of ways to mix stopping clay, but the main thing to guard against is not to have it so wet that the iron will fly.

Hold the bar so that it will point on about the same incline as the sand bottom, when tapping from the front with a long bar. In large furnaces where it is customary for the furnace man to stand on a platform close to and at one side of the spout, the clay is gently picked away from around the edge of the hole until the force of the iron bursts through the thin wall. When stopping the stream of iron the stick or rod holding the clay should be advanced from an angle downward.

POWER CROSS FEED FOR TILTED TURRET LATHES AND SCREW MACHINES

A compact power cross feed to the cutoff slide, has recently been developed for the Nos. 2, 3, 4, 5 and 6 Tilted Turret lathes and screw machines, manufactured by the Wood Turret Machine Co., of Brazil, Ind. This design of power cross slide allows casting the apron or gear box integral with the saddle proper and insures rigidity as well as permanent alignment of these parts. The power is transmitted to feed screw by means of two bevel gears on lower feed shaft meshing with a third gear on a vertical shaft, thence through helical gears to the feed screw.

A single lever control allows of feed engagement in either direction by simply moving through three positions. When the lever is in a vertical position the feeds are disengaged, while throwing lever to the left engages the feed to travel in. Moving lever to right reverses feed causing it to feed outward. Six feed changes ranging from .003 to .023 per Rev. of spindle are provided, any one of which is instantly available without stopping machine.

Provision is made to safeguard the feed mechanism against overload or accident by providing a brass shear pin on the lower feed shaft. This pin is easily replaced should it become necessary. The feed nut is made of bronze and is of the solid flanged type which allows it to be held in place by two cap screws. The feed nut being bolted to the back side of saddle allows it to be easily removed without disassembling the other parts. A large dial is fitted on hand wheel which is graduated to .001. Provision is made for clamping this dial at any point.

The feed screw is provided with two bronze bearings in the out board end of slide and which gives an extra long support. An ingenious method of taking up the back lash of feed screw in this bearing, is provided by means of a knurled adjusting nut which is locked by hand wheel. Positive screw stops are mounted front and rear which control the depth of cut when using forming tools.

Chaplets—How They May Be Avoided

By Using Proper Core Arbors and Otherwise Using Good Judgment, Chaplets May Frequently be Dispensed With

THE following article on chaplets and how to avoid them written by an anonymous writer and published in "Hardware and Machinery" an Australian publication is full of valuable information on the subject and shows that on that side of the world they have the same trouble as elsewhere. The author is evidently no lover of chaplets, and would avoid them where ever possible. There are places where a chaplet can be used to better advantage and for less expense than any other method and good results be accomplished, but there are places where a chaplet may do a lot of harm and should be avoided. By using judgment the arguments in this article can be used to good advantage in many difficult jobs.

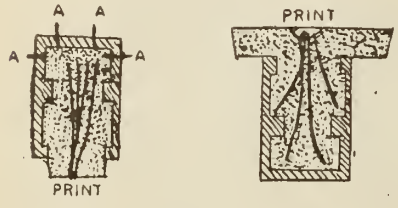


FIG. 1. FIG. 2.
Two methods of making piston

Chaplets are of various designs and types, but all serve the same purpose, that of holding the core in position during the time of casting and until the metal solidifies. After that, their usefulness ceases, and they become a source of weakness to the casting, causing leaks while under pressure and breaks under strain at the points of the chaplet stems. On any surface to be machined they are not by any means desirable, as they cause hard chilled spots and blowholes, thereby causing endless trouble.

While I will not say that chaplets can, or ought to be done without, all together, I do say that where a sound job is desired there is no occasion to use them to the extent now witnessed in everday jobbing foundry practice.

I have seen a cylinder casting for the starboard side of a boat with 32 chaplets on the top of it, and the same cylinder on the port side with four chaplets. This represents two different moulders' ideas of a good job; but that is by the way.

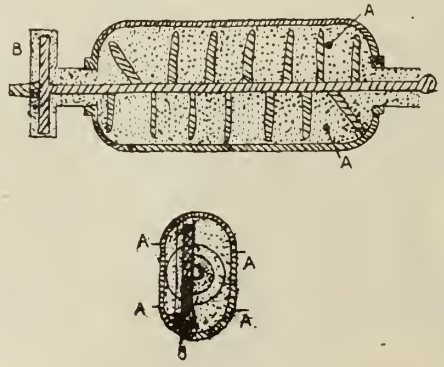
For my examples I have taken castings that are to be found in our jobbing foundries every day, and if your problem is anything like them, or if you can apply the principle, this article may be of some services to you.

But if you have a problem that worries you, pass it along. "Hardware and Machinery" may be able to assist in solving the problem.

Fig. 1 represents a piston for an internal combustion engine, made in such a manner as to require three chaplets on top A, and three on sides A, to keep the core perpendicular. The result of such a method is, a casting dirty and weak on the piston crown, where the greatest strength is required to take the force of the explosion in the cylinder. It also spells trouble from the chaplets on the outside driving machinery and blowholes.

Fig. 2 shows the same piston made upside down, the core hanging by print on top. No chaplets being required, a sound crown is obtained by having the greatest pressure of metal where strength is required. This may be made without using a top part of box, by having the print made a little deeper and fastening "gates" and riser on pattern.

Fig. 3 shows an oval casting, 18 in. x 10 in. x 3 in., having two outlets 2 in. diameter. This was made using four chaplets, top and bottom, shown AA. Two would have held the core down, but four were used to prevent canting, by having one end of the core continued out about 2 in. and putting on a square



Figs. 3, A. and B, superfluous chaplets and how to avoid them.

piece, as shown at B, and print to correspond on pattern. The job was successfully made without the use of any chaplets, and gave a core easily handled, care being taken to make the ends of the core iron secure by means of a rod through the top to rest on the ends of the core iron. In making a core iron such as this the centre bar ought to be heavy enough to carry at least five times the weight of the core. As the upward pressure equals four times, plus the movement of the fluid metal, the toes ought to be fairly light, and by striking the bar directly on the end the toes are stripped off, when the core can be cleaned out easily.

Fig. 4 shows a section of a centrifugal pump body.

The core iron is made with a balancing leg and disc in the centre AAA. This gives three points to hold the core down. The balance leg and that alongside of it are held down by the same method as in

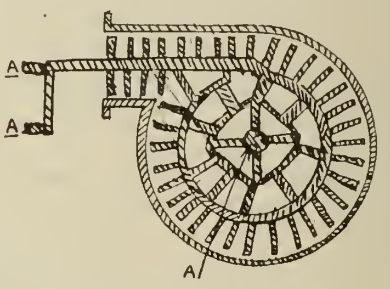


Fig. 4.—Balancing leg on arbor keeps core from tipping.

the last illustration. When making the core a making-up piece is placed on top of the disc cast in the core iron. The centre core is then made on a piece of tube similar to a core barrel, having one end flush with the bottom of the core. This is taken through the top part, and gives the principal means of holding down the core. In small bodies a piece of ½-in. iron is put in the centre core.

The usual method of making pump bodies shows two and sometimes three chaplets, which are, to say the least of it, anything but ornamental to the casting. By this method we have a casting that looks better, and can be made as quickly, if not more quickly, than by using chaplets.

Fig. 5 shows a section of a bend pipe and core iron, while fig 6 shows a U pipe and core iron. The usual methods of making such articles are too familiar to require any explanation, and the sketches to a great extent explain themselves.

In putting these cores in the mould they are placed on pieces of wood the

required thickness, according to the metal, and the balance leg and end of the core iron and made up iron to iron, at AAAA. After lifting out the core and removing the pieces of wood the core is placed back in the mould. Some may prefer to have a loose balance leg, that is, at B. A flat lug is cast on to the core iron, and a leg, which is included in shop tools, usually made like a large spanner to fit over the lug, is wedged on to the core iron. But that is a matter of fancy; it is the principle I am writing about. After all there are a hundred and one correct methods of doing everything in the foundry.

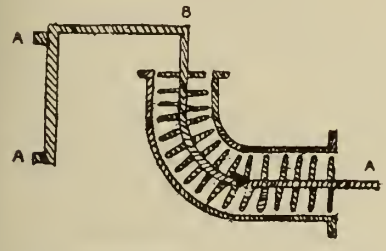


Fig. 5.—Leg keeps arbor and core in place.

One of my reasons for writing this article is, that I heard a gentleman say not long ago, "Acid castings cannot be made in Australia." It may be explained that castings used in the manufacture of nitric, sulphuric, muriatic, and such acids must not have any wrought iron or steel chaplets in them, as the acid destroys such metal very quickly. Nothing but high silicon or high carbon irons will withstand the action of the acid. Now, cast iron chaplets are ugly and cause bad castings, and you may be asked one day to make a casting for one or other of the acids manufactured in Australia.

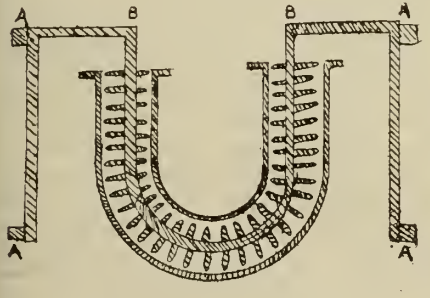


Fig. 6 tells its own story.

Let this set you thinking, and if you find yourself up against a problem that requires assistance, let us have a look at it, for the foundry more than any other place I know of is the place where no one man "knows all there is to know."

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For the Man Who Works in the Shop

BEGINNING with the next issue of Canadian Foundryman, this section will take on its winter apparel and become a fireside magazine for the man who works in the shop. During the hot weather such as we experienced during the last few months it was a difficult proposition to take an interest in work but now that the evenings are becoming longer and cooler, and the fireside becomes more attractive, the man who has his work at heart will enjoy reading what others have to say along the line in which he is interested. Foundry business is interesting if the foundry in which it is being done is up-to-date in sanitary and other respects. If it is not, this is a good subject to discuss in our mail box section. Molders should no longer work in shops which are not fit to work in. This will be one of our chief topics always—to make the foundry a fit place in which to work.

Watch this page in succeeding issues, as it will contain practical articles on molding, core making, and everything which is of interest to the man who works in the shop.

THE SCHOOP PROCESS OF METAL SPRAYING

A new and novel process for metal spraying has lately been introduced and bids fair to meet with success. It is known as the Schoop Process.

Unlike electro-plating and galvanizing which are immersed in a bath this process sprays the liquid metal onto the object to be plated. Although modern on this side of the Atlantic the process has been in successful operation in Europe for several years.

Theory of the Process

By this process the coating metal adheres to the object chiefly by mechanical union. The metal is discharged in hot impalpable particles moving with high velocity, and these when directed upon a prepared object penetrate the pores of the latter while the spray is still plastic. The coating metal thus dovetails itself into the superficial pores of the object and does so in the presence of reducing gas which prevents oxidization at the juncture of the metals.

The apparatus is so designed that the gases employed stream out at a high speed and are ignited on emergence from the pistol, an arc being formed at the point of contact with the projecting metal wire, which instantly pulverizes the metal and throws it forward under pressure. This molecular spray by presentation secures a perfect adherence to the surface under process of coating and rapidly builds up to the thickness required.

In general the applications of the process may be divided in five groups, viz: protective coatings; bonding or junction coatings; electrical coatings; decorative coatings; detachable coatings.

Protective coatings on steel or iron may be either original coatings of the whole of an object or any part of it or local applications with the pistol to repair damage or wear of a coating made by another process. The repair of the troublesome defects on galvanized sheets and structures made of these is an example. The localization of copper deposits on iron and steel for the purpose of the cementation process and for controlling hardening is easily and quickly accomplished by this process.

Many engineering structures used in the arts, such as steel and iron tanks, girders and machinery of all descriptions, are subject to the action of liquid and chemicals and corrode rapidly, particularly at joints. It is not possible to plate such structures by any other coating method. In such cases a metal is selected which will resist the corroding agent and is sprayed on all the seams and joints, these having previously been cleaned by sand-blasting.

In many cases the treatment of the joints is sufficient, the solid metal resisting oils and liquors for a long time when the seams are rendered free from attack. Railroad and bridge girders can be handled by portable outfits to protect them from the atmosphere and moisture. This is a large industrial field of application in which lead, tin, zinc and aluminum sprayings are used, and proper initial treatment of this kind in the shop or in the field during erection dispenses with all need for repeated painting.

Laundry machinery, dairy appliances, ranges, gas stoves, water heaters, and similar structures exposed to moisture and chemicals can be protected against oxidization and electrolysis in many cases by sprayed deposits of zinc suitably located, or may be wholly tinned or galvanized by the Schoop process.

Protecting iron or steel parts which are subjected to high temperature by coating them with aluminum has developed into an important application.

In the Paper Mill industry, beater bars, are successfully coated with zinc and copper, and many other applications are readily suggested.

Concrete, Stone and Cement Uses

Bonding or junction coatings can be freely applied to brick, metal, glass or porcelain connections with the metal spray. The porosity of stone, both natural and artificial, lends itself readily to this use. The refractory hearths of furnaces using the surface combustion principle are readily bonded by the Schoop pistol to their porcelain or metal gas-conducting tubes by spraying the assembled parts with a metal of sufficiently high fusing point. Ordinary solders are of no service in furnaces depending upon radiant energy and the refractory cements and mortars will not stand the necessary stresses and wear. This is a single instance of the bonding of non-metallic surfaces.

The applications enumerated above constitute but a few of those already proved and in use, which come under the head of protective coatings.

PATTERNS AND CASTINGS

By W. P. ESSEX

The Foundry, It's Attractions and Opportunities

THE processes employed in the manufacture of iron and steel are extremely interesting, especially in those departments of the industry where the metals are subjected to treatment at high temperatures, and worked in glowing colors from dull red to the dazzling white of fusion, or drawn in a stream from the furnace spout in the molten state. These spectacular features, peculiar to the metal industry are seen in the operations of the blast furnace, rolling mill, steel mill, and forge shop, and seldom fail to excite the wonder and interest of the spectator, unfamiliar with the picturesque side of the iron and steel industry.

There are few occupations among the various metal trades in which the different operations, to the final results, are of more interest to an observer, than that of molding. And whether the methods and proceedings followed by the molder are familiar to the onlooker or witnessed for the first time, the process is perhaps as interesting and attractive to them as one that, in our early days, seemed to magnetically attract the neighboring kids to the steps at the wood-shed door, when as a youngster the writer made sinkers for the boys in daubs of clay, melting the lead in an iron spoon over the fire in the kitchen stove.

There is a peculiar fascination about a foundry that clings, and compels the attention and interest, not only of the casual observer, or the curiously inclined, but also those who are familiar with every phase and aspect of the foundry, which the close intimacy of years does not seem to lessen or diminish. This is especially noticeable during the casting period.

Looking into the foundry at the end of a winter's day, illuminated now by the glow from the molten metal, which through the smoky haze is seen moving in all parts of the building in pots of various size and shape. A thick red stream of metal pours from the spout of the cupola into huge ladles, which when filled are lifted by the crane and swung around to pour the pit moulds, or run out in different directions by the trolley on the overhead rail, their molten contents caught in the ladles of the workmen at the further end, and with that peculiar springing gait, an acquisition of the foundryman, carried to the more distant floors to pour the waiting moulds, and as they fill up there follows a succession of reports from the flasks, the noise of the exploding gases, as the little jets of blue flame dart out from the partings of the boxes. The steam and smoke from the damp sand and burning cores mingle together in a blue grey haze, through which the dim foundry lights glimmer like dull red coals in the enveloping smoke. It is truly a weird and impressive sight, and although the writer, from a boy up, has inhaled the odors of the foundry, to linger awhile and watch the sight, if near when the wind is on, is a temptation not easily resisted.

The Other Side of the Picture

Very picturesque no doubt, and interesting is a study of the foundry during the pour off, but what about the molder? After hours of hard work shovelling and sifting sand, ramming moulds, and slugging flasks, he must face the hardest and most trying task of the day. What does he think about it, perhaps suffering from a lame back, an attack of lumbago, or a burned foot, is he susceptible to these same influences and attractions which seem to permeate the atmosphere of the foundry? Not much, there's nothing in it that would hold him to the shop for a minute longer than was necessary to shake out his floor, and wet down the sand. This is not to be wondered at by those who know from their many unpleasant experiences in the past, that the majority of foundries were not the most desirable places to spend time and effort in, no longer than was absolutely necessary to insure the day's wages, for the working conditions were generally bad. Too hot in the summer months, and too cold in the winter, the ventilation was generally poor, and the lighting worse.

A foundry scene. Pouring a mold.

It is not to be wondered at, that, as the demand for skilled workers increased, those industries that offered better working conditions, and more congenial surroundings than the foundry, attracted the young man with ambitions seeking a place in which to develop his abilities, and exercise his skill. And the time came when the demand for castings in iron, steel, bronze, and aluminum grew to such unpredecented proportions, that the foundries throughout the country were unable to handle much of the work that was offered them, and were compelled to refuse many orders for castings that would come unsolicited to their doors. This condition of affairs in some cases was no doubt due to insufficient foundry accommodation, but in many instances the inability of foundry proprietors to secure a sufficient staff of efficient foundry workers was no doubt the prevailing cause.

Changed Conditions

The demand for castings and molders is not as insistent at the present time as it was a year ago, but we are passing through a period of industrial depression, and would-be workers are more in evidence than waiting positions. It is also a readjusting period, and upon the length of time necessary to bring about these changes and adjustments, depends the return of normal conditions. It is interesting to note however, that the foundry business has not been affected to the same extent as many of the other industries, and present indications point to an early resumption of activities in all foundry lines.

Making the Foundry More Attractive

Although the foundry was the last of the important departments of the metal working industries to receive especial scientific, and expert mechanical recognition, it is wonderful what has been accomplished in the last few years. The old "good enough" conditions are rapidly passing, which may be readily seen, even if there is not the opportunity to get abroad and visit some of the most recently completed foundry buildings. It is only necessary to look over the pages of the trade papers associated with the metal industries, especially the advertising sections, and from the illustrations and descriptions given, learn of the great improvements that are being made in foundry buildings, and their equipment, the completeness of detail in their planning, and the new ideas incorporated in their design. The final results to date of scientifically directed effort, and mechanical ingenuity, to make the foundry, not only a more productive institution,

by the introduction of automatic machines, and labor-saving devices to conserve human energy, but a safer, surer, and more pleasant place where the workman, free from the annoyances and restraint caused by unfavorable shop conditions and inadequate working facilities, can in comfort and with a more contented mind, display his abilities, and contribute to the total result of the shop's united effort, his full quota of perfect and passed castings, the products of bench, floor, or pit, with satisfaction to himself and his employer.

Opportunities Suggested by the Study of Foundry Methods

The organization of some of the latest modern foundries, is so perfect that they are comparable only to an immense machine, rather than a number of assembled units. The timing of each operation is so exact and follow in such perfect order, that further than intelligent manipulation of the various devices throughout the foundry, the work progresses almost automatically, and with clock like precision so that today the foundry is a more attractive and interesting institution than it ever was before.

The development and building up of the modern foundry to its present state of efficiency, represents the resulting efforts of many master minds, trained in practically every science, profession, and mechanical occupation. The young man with foundry experience, and ambitious to rise, will find plenty of material for study, and many channels into which to direct his efforts, which if thoroughly explored would no doubt lead him into what might prove to be a successful career.

The proposed new foundry of a modern type, calls into consultation at the first plotting, the mechanical and productive engineers, and foundry manager. For the lighting, heating, and ventilating systems, engineering experts who have specially studied those features. For the design and construction, architect, structural engineer, and draftsman, and later the electrical and foundry equipment engineers, and still further on, the advice and services of the metallurgist and industrial chemist. Nor are those mentioned all, but what a wide range of openings and opportunities are presented to the young man, who has taken a full foundry course, in molding, core making, and cupola practice.

Why not Graduate from the Foundry?

There is perhaps no other branch of the metal industry that offers such exceptional advantages to a young man with a scientific bent to develop, or for the exercise of his inventive faculties, his mechanical skill, or executive abilities as the foundry, for there is a wideness and variety in the various methods, processes, and materials used, that is not found in any other department of the metal manufacturing plants.

There has been a serious shortage felt of skilled foundry workers due no doubt some of the aforementioned causes, and from the fact that prospective opportunities opening from the foundry, have not been brought to their notice, or fully appreciated by our young men, or by those who have the directing of youthful energy into profitable industrial channels. The foundry offers greater opportunities to the thoughtful and ambitious young man who will go into it, and practically study the methods of molding and foundying, from the sand pile up to the charging door of the cupola than in any other line of mechanical effort associated with the allied metal trades. And if circumstances or environments prevent advancement beyond that of a first class molder, there are always positions waiting for the capable and energetic mechanic with wages as attractive as those offered in any of the other trades, and if the work is hard, it is interesting, and by no means an unhealthy occupation, especially working under the improved conditions that today prevail in the modern foundry.

FURNACE TO MELT LEAD

An electric furnace has been developed by the Volta Manufacturing Company of Welland for melting babbit and similar metals. Experiments have been conducted with one of these furnaces for the past year and it has been subjected to numerous tests. It is designed for use in printing shops, machine shops and various plants where babitt or lead is used. The makers claim that no volatilization of the metal takes place, since the temperature is not allowed to reach the point where this would happen. The heating element covers a large surface of the pot and is of low density.

A COURSE IN INDUSTRIAL

For several years past there has been given in the Department of Metallurgy, McGill University, Montreal, an extension course in Metallography which has been attended by mechanics, engineers, chemists, and those desiring a "Hobby" or whose business brought them in contact with metals and who desired to have more knowledge of their composition.

No previous knowledge of the subject is assumed and the course is essentially practical from first to last. Ferrous and non-ferrous metals are dealt with equally and training given in preparing them for examination under the microscope and finally photographing the various structures which develop.

Anyone desiring to enroll should apply to Dr. Alfred Stansfield, department of Metallurgy McGill University or to the lecturers Harold J. Roast, F.C.S., F. C. I. C., or Charles F. Pascoe, F.C.I.C.

The first class will be held on Monday evening November 7th at 8 p.m., in the Chemistry Building McGill University.

Fee for the course of 15 periods $20.

As only fifteen members can be accommodated application should be made at once.

The microscopic equipment has been added to considerably this year, particularly in regard to the photographic end. If any former members desire to continue their work, provision will be made for an advanced class if sufficient members are obtained.

VALUE OF LUBRICANTS

Solid lubricants, such as mica, graphite and soapstone, have great carrying power at low speeds, but their value depends as much on the nature of the surfaces. Graphite, for example gives the best results when used on cast-iron surfaces, which are naturally very porous and hold the graphite, but the frictional loss and wear are great. Solid lubricants mixed with animal fats, greases, vaseline, or rosin oil are suitable for low speeds and heavy loads, as they give a low coefficient and do not waste away rapidly by evaporation nor run off the bearings. Greases compounded from animal and vegetable fats, or mineral oils emulsified with water soap and alkali enough to neutralize them, are good lubricants for slow-moving bearings with excessive loads, provided the oils do not contain too much water and are not adulterated with foreign substances; the oil should not run down and leave the soap, which is liable to occur in poorly made greases.

THE YANKEE NICKEL

It might be interesting to the average individual to know that the little American coin, once common in our trousers pocket but not so common of late, and known as a "Nickel" is composed almost entirely of copper. This is a phenomenon which is hard to explain in connection with copper. Three pounds of copper mixed with one pound of nickel makes an alloy as white as silver. Where the red color disappears to is hard to say. Some will credit the nickel with having a powerful bleaching influence, which may be true, but there are other metals which will whiten more copper than three to one. However the American five cent piece is composed of 25% nickel and 75% copper.

BOMENTAIG

An old fashioned compound but one which is still popular where known is bomentaig. It is a filler for defective castings and is made by mixing two parts of sulphur with one part of plumbago. The sulphur is first melted in a ladle and the plumbago stirred into it. When thoroughly mixed and while still melted it is poured and allowed to cool. This material is carried in stock and when required, a piece is broken off and put into the defect and rubbed down with a heated iron which melts it and causes it to fill all the space and at the same time adhere to the metal.

Producing Small Nonferrous Castings

Paper Read at Foundrymen's Convention Columbus, O., Relates Mainly to One Article But Applicable to Many Others.

By RAYMOND H. SULLIVAN

THE OBJECT of this paper is to outline the problem of producing daily a large number of small duplicate nonferrous castings and to describe a method of solution. Many of these castings are machined for interchangeable components in the productive output of a large manufacturing establishment. The examples and illustratons which follow are taken from the practice in the brass foundry of the Yale & Towne Mfg. Co., Stamford, Conn.

Thirty Base Formulae Used

While this paper deals with the production of one particular article from the base metals to finished castings, the principle involved is typical of several thousand somewhat similar castings varying in shape, size and composition. Some 30 base formulae are used in the composition of the various castings, the composition depending upon the use of the metal in the finished product. The castings range from bronzes involving high tensile strength and a large percentage of ductility to clear, soft, high finish brasses and bronzes, where colors are the prime requisite rather than strength.

While the processes described are employed in quantity production, castings are not produced under continous operating conditions, day in and day out; consequently the greatest application of semiautomatic or full automatic equipment, such as travelling conveyors or rotating tables, etc., for handling molds, cannot be utilized. It is fully realized that where small identical castings are produced day in and day out, year in and year out, a much more efficient method than described herein can be applied.

Orders Range from Two to Fifty Thousand Pieces

This description, therefore, is intended to show how production is obtained in a large foundry, with a large variation in output of small brass and bronze castings in quantities varying from two to 50,000 pieces per order, and which run in production time on one set-up of moulding machines from three days to three months.

Incidently, the author believes that some experimental work in electric melting of nonferrous alloys in comparison with that of oil melting would be of interest to those interested in nonferrous foundry practice.

The manufacturing establishment whose foundry practice is described in the following, has been engaged in extensive experimental work with electrical melting and the results obtained are included herein. These experiments are still in progress and have not been finally completed, in that further confirmation and checks of the results shown are desired. The experiments, however, being in line with advancement and progress in the state of the art of nonferrous foundry practice, are interesting in that they apparently closely check the claims made by manufacturers of furnaces and those investigators of electric melting who have published their results. The fact that nonferrous castings of 40,000 different parts are ordered from the foundry during the normal year, of which approximately 10 per cent are ordered in large quantities, necessitates careful planning and close adherence to the plans, in order to insure delivery of the castings when required.

How Production Schedule is Planned

The basis for this planning is a schedule issued each half year. This schedule consists of quantities of units, the quantities being based on the sales of the preceding six months and the judgment of the sales and stock organizations in conference. From this schedule, which is in terms of product units, a plan is laid out to cover the manufacture of each of the parts entering into these units, in each of the various departments in which work is performed on them. This plan is received in the brass foundry by a despatch clerk, who is the representative of the production bureau, a part of the executive organization which controls and plans production throughout the plant. The dispatch clerk immediately enters requisitions for the manufacture of cores, based on the actual working time to produce them and to insure their delivery a day in advance of the date upon which it will be necessary to start the actual moulding in order to meet the plan. The moulding date is calculated from the actual man hours required to produce the quantity of castings on any order. The dispatcher also orders patterns to be delivered from the pattern vault a day in advance of the actual moulding date. These patterns are delivered to the pattern rack in the foreman's office and represent the work which he must have in the sand on the succeeding day. By using a tickler system, the dispatcher can be certain that the cores and patterns are actually delivered at the required time.

Fig. 1.—Pattern for molding padlock shackles.

The foundry foreman, by using the information of the dispatch clerk and in close co-operation with him, has an opportunity to know a considerable time in advance whether the required production is increasing or decreasing and is enabled to plan accordingly.

Plots Delivery Against Requirements

As an additional control against the possibility of failure to produce, a curve showing the total delivery of castings for each class of product, as against the required delivery, is maintained in the production bureau office. These records, while they do not indicate detailed failure, do reveal tendencies towards tardiness, and lead to close inspection of the detailed records in the foundry dispatch clerk's office. It is thus readily seen that a specific production failure is quickly discovered.

The foreman of the foundry, having compared his scheduled requirements with his average production and plan, can practically limit his attention to the actual moulding and foundry operations, giving out his work from the pattern rack a day in advance of the time for starting moulding.

The component selected for detailed description is a padlock shackle, known by the list No. 805.

The pattern shown in Fig. 1 consists of a gate of 16 pieces which is permanently fastened to a cast iron plate containing one half of the gate and castings which make a complete mould when the cope and nowel halves of the mould are placed together, as shown in Fig. 1.

Method of Molding

The molding is done on an air squeezer machine. The cope and nowel are made from the same pattern and a sprue is provided for in the cope board. Care must be exercised by the patternmaker in setting the pattern exactly in the center of the plate, otherwise a shift will occur, spoiling the casting.

The moulder is provided with a helper, whose duty it is to graphite the flask pins and carefully clean the flanges of the metal flasks, thereby preventing a possibility of a thicker casting than desired. He likewise sets the finished mould on the pouring track, puts the weights on and, after a rack of molds is poured, shifts the weights and breaks off the spruce heads of the hot moulds.

Each two moulders have one extra

helper who dumps the moulds removes the castings and puts back the empty flasks at the moulders' benches. This being done, he wets and cuts the sand.

Upon completion of the day's work, the three helpers clean up the two floors and return the backstop to the metal cage, where a responsible man is stationed to see that it is not mixed with other metals of different composition.

The hot metal for the castings is carried to the moulders by two bar holders in a No. 25 crucible, which has been previously preheated. The moulder skims and pours his own metal, and in this way becomes so well acquainted with the heat that he can readily decide when his metal is at the proper pouring temperature. Moulders are chosen from the above mentioned helpers by careful observation of the foremen and, with systematic training by regular instructors, are developed into competent workmen.

After the castings are dumped from the moulds and sufficiently cool for handling, they are taken by truck, to the cutting off room, where they go through the following operations.

First they are chopped from the gates as shown in Fig. 2, each man's work being kept separate. The gates are likewise kept separate in order to avoid the mixing of the different metal mixtures. An interesting innovation just installed is also shown in Fig. 2. This consists of an air hammer used to vibrate gates of castings containing cores. This system quickly and efficiently removes the cores from the entire gate of castings.

Next the castings are removed to the grinders who grind off the balance of the gate left on by the choppers. From the grinders the castings are removed to the sand blast machines, where they are sand blasted for approximately 10 minutes, after which they are taken to the inspectors who carefully separate the good work and make their returns on a ticket for the benefit of the timekeeping department. Moulders are paid only for good castings. These operations having been completed the castings are tumbled in wet tumbling barrels, for about seven or eight minutes when they are weighed and shipped according to designated routing on a special "move" ticket.

Sand Blast Castings on Gate

An alternate procedure is frequently followed in the cutting-off room. Instead of first chopping the castings from the gate they are sand-blasted on the gate, and then chopped and ground. By this method, the backstop is rid of the undesirable sand which clings to the gate and gets into the heat in which this backstop is used. It is likewise preferable to the choppers and grinders from a standpoint of cleanliness. This method, however, is slower, and therefore, is not used except occasionally when operating conditions warrant it.

A moulder on this pattern averages approximately 20 moulds per hour, giving a production of about 180 moulds per day, 16 pieces per mould, or in all about 2,880 castings. Deductions are made in the moulder's pay should losses occur due to faulty work on his part. This has a tendency to keep the moulder on the lookout for pouring his metal properly and prevents his putting up moulds in a careless manner.

A very exact and convenient means of setting cores for a mould requiring numerous cores is shown in Fig. 10. A plaster paris mould is made which corresponds to the mould in which the cores are to be set. The core setter sets the cores on the plaster paris mould and the moulder, on completing his nowel half, sets it on the plaster mould. Upon reversing the nowel, prior to placing the cope half, we find the cores neatly set without disturbing the sand in the nowel. This method has proved to be very advantageous and is now used to a great extent.

Scrap is Salvaged

Several of the metal mixtures in use contain some turnings or scrap. Brass and bronze scrap from all over the works is sent to the salvage division, where that part of it considered satisfactory for use without refining is selected and

Fig. 2—Cutting castings from gates.

stored in the melting room. The skeleton scrap and defective castings and all of that scrap which is likely to contain iron parts is screened and a hand magnet run through to remove iron or steel parts. The turnings are run through riddlings and magnet machines and the rod turnings burned to remove the oil. A part of this scrap in turnings is then analyzed and recorded to permit of a correct mixture when the new metal is added.

All of the new metal is stored in a metal cage and upon being issued to the melter, the weight of the charge is carefully checked three times.

The metal for casting the shackles is regularly melted in oil furnaces in crucibles. Experiments with electric melting are now in progress and seem to meet with success.

In oil melting, a melter supervises the melting for three furnaces with a helper for each two furnaces. An hour in advance of the time for the moulder to commence work in the morning, the melter with his helper weighs out one day's supply of scrap and turnings. This scrap is fed to the furnace as fast as it melts down and when just hot enough to pour, is cast into ingots.

Four Heats A Day's Work

Four heats per furnace of 170 pounds each is considered a day's work. These ingots are then reweighed by the melter and the new metal for each charge drawn from the metal cage. The charge is melted down with ingots and new metal in proper ratio and covered with charcoal before it reaches a temperature at which it is easily oxidized and remains covered until poured. It is then carried to the moulds in No. 25 crucibles, by means of an overhead trolley system, the crucibles having been preheated to a temperature depending upon the size of castings to be poured. Four heats of 170 pounds per day is the task for this work, the moulders working from 6 a. m. until about 4.30 p. m. At the end of the day's work the melter gives the cage checker a card showing the amount of metal melted and this is checked against the amount of alloy issued to him. All ingots which have been poured by a melter are weighed and stored in the metal cage each day.

In the experiments now being undertaken with electric melting, the following procedure has developed.

The handling of the metal up to the point of charging the scrap and turnings to the furnace is exactly the same as in the oil furnace. Approximately 200 pounds of turnings and scrap mixture are charged into the furnace and heated for about 20 minutes at from 40 to 50 kilowatt-hours. The furnace is oscillated to mix this melt at intervals of approximately two minutes until the input reaches 80 kilowatt-hours, when the mixing process is operated continuously until approximately 100 kilowatt-hours have been used. The new metal is then charged and the heating continued until about 110 kilowatt-hours have been consumed. No charcoal is used, there being but small openings through which the metal could be exposed to the air. The molten metal is then carried to the moulds in exactly the same manner as that used with the oil furnace. Six heats of approximately 600 pounds can be melted per day.

New Metal Added Directly to Scrap

With this method the scrap is not moulded into ingots but the new metal is added directly to the molten scrap and turnings. At the end of the day's run, the melter gives the cage checker a card showing the total amount of metal melted and this is checked against the amount issued against him. The elimination of making scrap into ingots results in a very large saving.

The experiments thus far indicate that electric melting is considerably more economical than oil melting. In melting direct from the oil furnace into the moulds the experiments indicate

that electric melting saves about 38 per cent. when double melting is employed in using turnings, melting first into ingots, then ingots remelted with new metal, a gain of about 70 per cent is indicated by the experiments with electric melting.

In conclusion, the writer wishes to bring to the notice of the readers several factors which must be considered in the analysis of quantity production of nonferrous alloys The problem of producing continuously quantity production of the same identical article is very different and much more simple than producing large quantities for a short period of time, with a variation of composition. In the former case greater application of automatic and semi-automatic devices can be supplied.

Records Are Important

Too much emphasis cannot be made upon the importance of records, not only of composition and analysis, but records of production, output, backstock, losses, reclamation, output per moulder, etc. Records to the production foreman or superintendent are a large factor in guidance in obtaining efficiency of operation. Efficiency of operation is the basis of low costs in production.

The conclusions to be drawn from the experiments of electric melting described, indicate that the trend of nonferrous foundry melting is rapidly leading to the adoption of electric melting.

No attempt in this paper is made to describe the various types of electric furnaces, as the writer believes that each particular foundry must make a thorough analysis of the various types of furnaces and systems of melting now offered by the manufacturers and by a process of elimination, determine upon the particular type or system best adapted to its product.

Bronze Dining Table From Boscoreale

Found in the Villa Rustica, in Fair Condition, But Slightly Cracked on Account of a Wooden Door Decaying Under One of the Legs

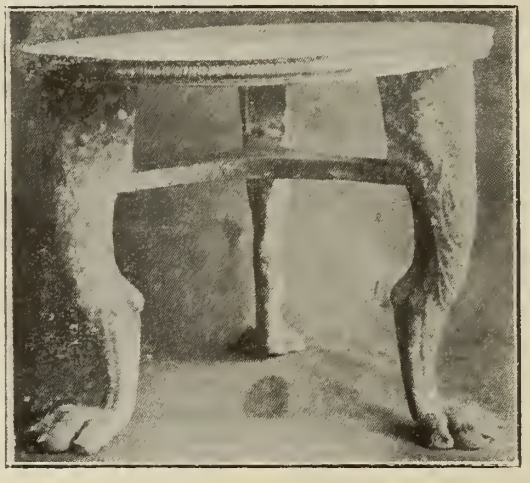
By F. H. BELL

THE bronze table shown herewith was taken from the same Villa as was the bath tub shown in last issue. Bronze would seem a queer material from which to make household furniture, but in the old Roman days it was quite common. It will be remembered in the description of the villa that one room contained a wine press. The production of wine was, in those days as now, a leading business in that locality. This table, the finest piece of the collection was found in the wine press room, along with other articles which indicated that this room had been converted into a sort of living apartment, with the idea that it might be a safe refuge until the outbreak of Vesuvius had subsided, a hope which was proved fallacious by the presence of the skeletons of two men and a woman. Some of the mechanism of the wine press was under the floor and a wooden trap door leading to this was in the floor. This door was partly closed and the table was standing partly on it and partly on the solid floor. This door having become decomposed leaving the table only partly supported, it had been bent toward the opening and broken. The present good condition is due to modern repairs, executed since being unearthed.

It is a table slightly under two feet in height, and slightly over two feet in diameter. The damages which it sustained consist of one leg cracked just below the knee of the lion's leg which it is intended to represent. This crack extends almost from front to back. One claw, on the same leg is freshly broken off and is probably in the private museum of some workman who assisted in the excavation work. The feet of both legs are cracked. The brace and top seem to have been soldered together recently.

On top of this table were found a bronze dish and two bronze pitchers.

There is the usual green and blue oxidation. On top are some patches of brown, which seem to be iron rust due to contact with some piece of that metal.



Bronze dining table taken from the Villa Rustica, Boscoreale.

The table was made of five pieces, that is, the top, three legs and the brace, all of which are cast. The component parts were doubtless soldered together, but the joinings, which now appear, are mostly, if not all, modern. There seems to be no trace of rivets.

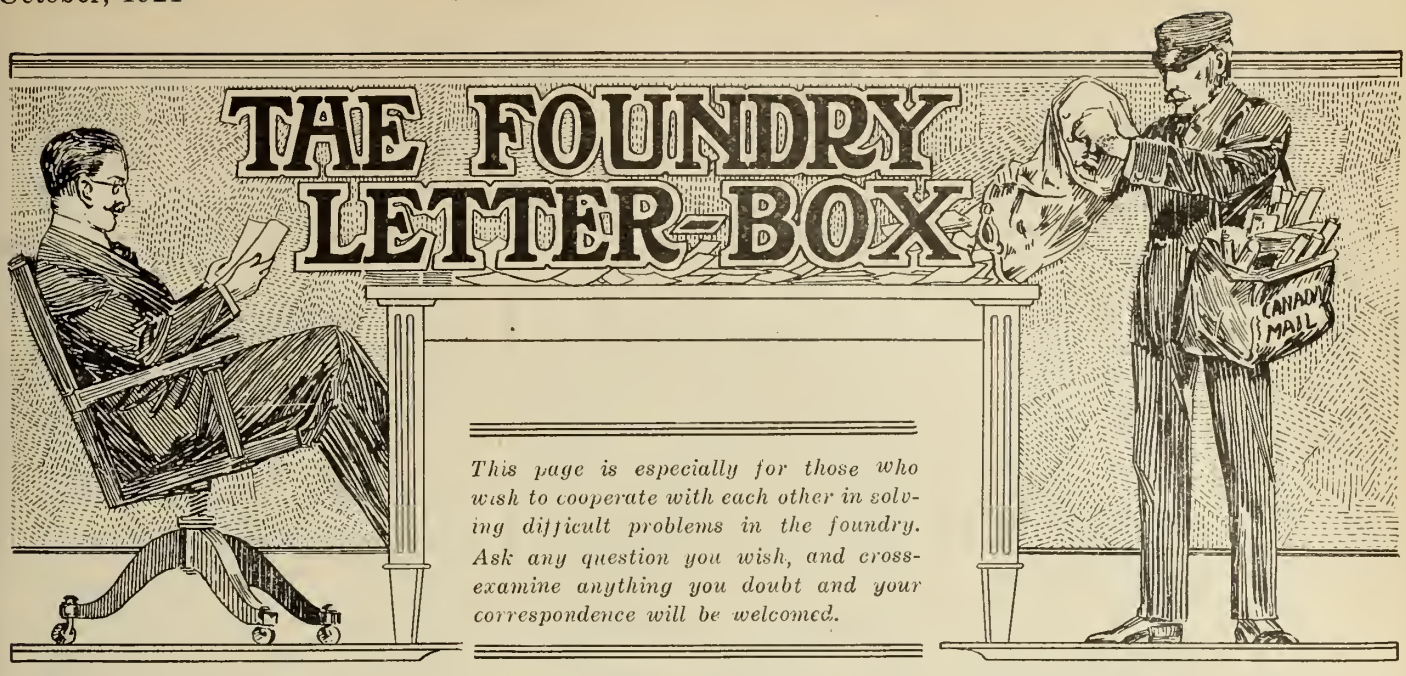
The top is a round sheet of metal, plain on its upper surface, but with the edges turned down so as to give the appearance of great thickness, and molded in the form of a cyma recta or ogee moulding. The cyma is decorated with a conventionalized leaf-pattern carried out plastically as well as by the usual grooves.

The hollow legs are shorter than those of modern tables because it was intended to stand beside a couch in accordance with the ancient custom of reclining at meals. They are immovable, unlike those of many tables of that time which could be spread out and folded up. In form they represent the hind legs of lions, except that the backs are plain above the brace. Muscles and sinews are carefully indicated, together with a system of veins which run about the toes and up the foot, and appear also at the back of the legs.

The plain flat three-arm brace rests upon short stubs which project from the legs about two-thirds the height of the table.

Similar tables with, or more often without, the brace, sometimes with claw feet, sometimes with hoofs, as well as a more conventionalised types in which only the feet preserve the original animal form represented on a nmber of Roman monuments according to reports of those who have visited ancient Roman tombs. To the Romans of the Empire, however, they must have seemed of antique or old-fashioned style. We find substantially the same forms in illustrations of Hellenistic grave-reliefs from the Greek Orient, and, occasionally, in place of the ordinary rectangular table, on Attic grave-stalac. The elements seem to derive ultimately from both Babylonia and Egypt through the medium of Iona. The tripod or three legged characteristic is Baylonian while the animal legs would savor of Egypt.

Even though this table was in this house or villa at the time of the eruption of 79, A.D., it may even then have been an old relic.



This page is especially for those who wish to cooperate with each other in solving difficult problems in the foundry. Ask any question you wish, and cross-examine anything you doubt and your correspondence will be welcomed.

Wants Information On Sand For Steel Molding

Editor:—I would esteem it a favor to have your advice on the following matter. We have trouble at times in steel foundry with sand pockets and rough surfaces on castings caused by heat of metal lifting the facing. At present our mixture for heavy castings is as follows: fourteen (14) parts new silica sand to eighteen (18) parts old sand, 1 part fireclay, the whole being tempered and milled with Goulac, 10 lbs. to a barrel of water. For light work we use old sand, eighteen (18) parts to two (2) parts new and tempered with Goulac as above. The quality of castings seems to vary according to the brand of fireclay we use.

Using Goulac as a binder please advise regarding a facing mixture for heavy work and another for light castings. such as are made in snaps or stocked, also a good core mixture for general purposes.—Fdy. Supt.

Answer:—By sand pockets and rough surfaces I take it that you mean that the castings are scabbed, as you say the heat of the metal lifts the facing. There are two causes for this. You are carrying too many parts of heap or old sand for the amount of new sand in your mixture of sand for the heavy castings. A more suitable mix would be two parts of new silica sand and one part of old heap sand. This with a proper amount of binder should stop your trouble, but ten pounds of Goulac to a barrel of water would be a very weak binder. You should dissolve from twenty-five to forty lbs. of Goulac in a barrel of water and use this to temper your facing. The molds will, of course be thoroughly dried. If not you are likely to have trouble, no matter what facing you use. Goulac is the trade name of a dry binder but the above is a fair proportion of the different ingredients. This can be improved by the use of a small amount of salt. A general receipt is hard to arrive at without trying out the sand.

A good core mix would be 18 parts old sand, 14 parts new silica, 2 parts fire clay, ½ to 2 shovels of dry Goulac, according to strength of core required. Temper with water. Notes—in dissolving dry binders use hot water. For a wash use silica flour or water glass. If Goulac or similar binder is used it can be improved by using a little bit of salt.

Wants Information On Railroad Brasses

Will you kindly give the standard specifications and formulae for making railroad brasses and babbitting the same, also explain how it is done—are the brasses bored out and then tinned and then babbitted?

Answer:—The term railroad brass is rather indefinite as it includes axle bearings for freight cars, side brasses and journals, bearings for locomotives, turntable brasses, etc., a beeter grade of bearing metal being used on a locomotive than on the freight cars. Each company has its own ideas about mixtures but the best work calls for a mixture of approximately 80 copper, 10 tin, 10 lead. The copper and tin without the lead was formerly used but the lead adds to its anti-friction qualities and makes it less expensive. This bronze is suitable for locomotive journal bearings, but what I think you are referring to is the freight car axle bearings. The standard metal for what is termed car brass is copper 77, tin 8, Lead 15. The lining for this is composed of lead 80, tin 12, antimony 8. Some companies will insist on the lining containing a small percentage of copper in which case one pound or even a half pound of copper is quite effective in one hundred lbs of the formulae just given.

The rough usage on a freight car makes it better to fasten the lining with tin than to depend on any form of anchors. The brasses are not bored previous to tinning. It is not even necessary to have them smooth provided they are clean. The casting if properly pickled will be all right. Before applying the tin the brass should be heated to above 445 F. the melting point of tin.

It is then moistened with muriatic acid in which zinc has been dissolved, after which a stick of tin is rubbed on the surface. The babbitt is then melted and poured onto this, the mandrel, of course being first put into place.

In connection with the above I would say that these formulae are for high grade work such as wealthy railroad corporations demand, but since tin is a very expensive metal it is becoming the the rule to cut down on the tin. It is quite common to use a mixture of lead 5 and antimony 1, for linings, and muntz metal, which is composed of copper 3, and zinc 2, is frequently used for the brass. Muntz metal is stronger and cheaper than the regular bronze but it has bad antifriction qualities. Where it is lined this should be of secondary consideration.

Locomotive journals are made from phosphor bronze or else from copper 88, tin 10, zinc 2. Phosphor bronze is the same as the latter with the exception that the zinc is omitted and ½ of 1 per cent phosphorous substituted. Both phosphorous and zinc are deoxidizers, but must not both be used in the same mixture as they counteract each other and spoil the effects of both. On some of the smaller bearings on a locomotive it is the rule to make the bearings of good bronze and then have a dovetailed groove cast diagonally across so as to make a half circle in the length of the bearing. This groove is babbitted and peaned with the back of a hammer and then bored out with the rest of the casting. This is said to make the bearing run cooler.

Toronto.—In connection with tenders for the Pure Food Building at the Canadian National Exhibition, W. G. Edge & Co.'s tender of $8,950 for plumbing and drainage was recommended by the City Architect.

Carborundum Linings for Brass Furnaces

Explaining How Carborundum Refractories Are Applied to Problems in Crucible, Tilting or Rotary, and Reverberatory Furnaces, With Records of Certain Installations.

By M. L. HARTMANN

This paper was prepared by Dr. M. L. Hartmann, Director of Research Laboratory for the Carborundum Co., Niagara Falls, N.Y., and was read by him at the American Foundrymen's Convention at Columbus, Ohio, Oct. 4-8, 1920. It will be read with interest by those who are in any way connected with the brass foundry business, as a step forward in refractory linings. Several Canadian foundries are already using this material, among them being the James Morrison Brass works which was described in a recent issue of Canadian Foundryman.—Editor.

WHILE carborundum refractories have been used for many years in various types of furnaces used in nonferrous metallurgy, recent investigations have indicated that their usefulness and economy are even greater than is generally known. For this reason it seems desirable to call attention to the developments in the use of carborundum products for refractory purposes, especially in non-ferrous metallurgy.

In order to have clearly in mind the distinguishing properties of carborundum refractories, it may be well to briefly review the physical and chemical characteristics of silicon carbide: High decomposing temperature (2240 degrees Cent.), no softening nor transition temperature below decomposition, high thermal conductivity, low coefficient of expansion, great resistance to chemical action, and extreme hardness. Four types of carborundum refractories are manufactured: Recrystallized shapes, bonded shapes, cements, and firesand mixes.

The recrystalized shapes are composed entirely of silicon carbide, being held together by the intergrowth of the crystals. This material has all of the refractory properties of carborundum itself.

The second type of refractory is composed of carborundum crystals held together by a small percentage of highly refractory bonding material. Three varieties of this type are produced, varying slightly in properties. All of these are similar in properties to the recrystalized product but are slightly less refractory. Large and more or less intricate shapes, which are not possible in the recrystallized material are manufactured in bonded carborundum.

As the principles of refractory engineering are developed, it becomes more and more evident that there is no cure-all for furnace troubles. Refractories must be prescribed for the particular application in question. A complete line of carborundum raw refractories in the form of wet and dry cements has, therefore, been developed in order to provide suitable refractories for the many kinds of furnaces. These cements are used for molding shapes directly in the furnaces, for laying up refractory shapes and for general repairing and patching. Some of these cements can be vitrified only at the highest temperatures, and consequently may not be used for installations in which only moderate temperatures are encountered. Others are made especially for lower temperatures and these would not be entirely satisfactory in the highest temperature work. In all these mixtures, however, the primary material, that is, carborundum, is of the greatest refractoriness and the variation in properties can be made only in the bonding agent.

The firesand mixes are raw refractories intended principally for use in rammed up linings. Carborundum firesand is composed principally of silicon carbide together with possibly some silicon oxycarbides formed by the partial reduction of silica at the high temperature of the electric furnace. While firesand does not withstand the extremely high temperatures at which carborundum bonded and recrystallized refractories may be used, it is has high refractoriness in comparison with other types of materials used for furnace linings.

Properties of Bonded Carborundum

	A	B	C
Composition, silicon carbide.	Above 90%	Above 90%	Above 94%
Apparent density	2.45	2.52	2.60
Fusion point, deg. Cent.	Above 1800	Above 1800	Above 1800
Specific heat (23 deg. C.)...	.18	.18	.18
Thermal conduct. (average to 1000 deg.)	.019*	.019*	.019*
Specific elec. resistance, 25 deg. Cent.	.....	100,000 oh./cm³	125 megohms/cm³
Specific elec. resistance, 1500 deg. Cent.	.....	750 ohms/cm³	8500 ohms/cm³
Spalling, rel. to best fireclay	One-half	Equal	One-thirtieth
Abrasion cold relative to best fireclay	One-twelfth	One-twelfth	One twenty-fifth
Abrasion, hot, relative to best fireclay	One-tenth	One-fourth	One-tenth

*Gram calories per deg. centigrade per cm³ per. sec.

Properties of Reerystallized Carborundum

Composition, silicon carbide, per cent	98–99
Apparent density of brick	2.30
Porosity, per cent	28
Specific gravity	3.18
Tensile strength, pounds per square inch	1000–2000
Crushing strength, pounds per square inch	12,500
Specific heat 23 degrees Cent.	.162
Thermal conductivity av. 600° to 1200°C.	.021*
Specific electrical resistance at 25 degrees Cent., ohms per cm³	100
Specific electrical resistance at 1500 degrees Cent., ohms per cm³	1.6

Spalling, equal to best fireclay.
Abrasion, cold 1/25 best fireclay brick.
Abrasion, hot, ½ best fireclay brick.
*Gram calories per degree Cent. per cm.³ per second.

Requirements of Refractory Mix

For use in molding refractory linings in place in the furnace it is necessary to use with the carborundum firesand some material which will bind it together firmly at all temperatures encountered within the furnace. In order to secure the maximum service from a furnace lining, it is quite essential to prescribe a raw refractory mix which when burned will have great strength in all parts and sufficient refractoriness in the hottest zone. Many clays, frits and other bonding compositions have been tried with more or less success but the most successful and universally used mixture consists of firesand, a refractory clay and sodium silicate or water glass. Suitably prepared mixtures for various purposes may now be secured, or the carborundum firesand in various degress of fineness, without bonding material is available for foundrymen who prefer to make their own refractory mixtures.

It has been found that the proportions of the different sizes of particles have important bearings upon the strength,

textureand refractoriness of burned firesand refractories. In the prepared mixes which have been placed upon the market, the sizes of particles have been carefully standarized the most satisfactory clay has been selected and the proper amount of sodium silicate for the particular installation in question is furnished, so that, unless a foundryman has had considerable experience in the use of carborundum firesand it is probably safer and more economical to use the recommended prepared mixture. These raw refractory compositions represent the best possible combination as determined by extensive experiments and commercial installations.

Applications of Carborundum in Crucible Furnaces

Many of the applications of silicon carbide refractories have been standard practice for a number of years. This is particularly true in both gas and coke-fired crucible furnaces in which carborundum firesand has been used extensively in making rammed up refractory linings. This type of lining for crucible furnaces has numerous advantages. It is easy to install because the forms used in the ramming are simple and easily constructed. The lining is highly refractory. It is not slagged down by the ash from the coke and clinkers are easily removed without injury to the lining. The inner surface is mechanically strong and withstands the severe treatment to which a coke-fired crucible furnace is subjected.

In oil-fired furnaces, firesand linings are very resistant to the flame erosion, and the linings are not melted in the zones of local heating, which are encountered with both oil and gas flames. In one large installation of which records have been kept 650 heats per furnace have been obtaned, and the furnaces are still in operation.

The decreased maintenance cost of rammed firesand linings is extremely important in keeping down costs per ton of metal. In some plants, the night and Sunday repair crew has been eliminated or reduced to a very few men.

There are applications in which it has been found advantageous to use refractory shapes in place of the rammed firesand linings. This, of course, increases the cost very considerably but is economical because of the decreased repairs and certainty of operation. For example, one brass foundry making large castings must have 20 crucibles of metal from coke-fired pit furnaces ready for the same pouring. They have adopted shaped refractories even at the higher cost, expecting to compensate for this by greater efficiency in operation.

In another instance, a comparative test was made of the merits of rammed cement linings and rammed firesand linings in oil-fired pit furnaces. Several linings of each kind were made and all run in the same way. While the cement linings lasted longer and required less patching and attention than the firesand linings the additional service did not warrant the extra cost of the cement.

In many brass foundries it has been found advantageous to use one of the cements as a protective layer over firebrick linings. This coating is applied to a thickness of about ¾-inch and has been found to greatly increase the life of the furnace lining.

It is quite well known that refractory linings most frequently give way at the joints and to remedy this carborundum refractory cements have been developed and used. In some cases the life of the furnace lining has been doubled by the use of the proper cement for laying up the bricks.

The prepared cements are also useful in general furnace patching. Many operators have discovered that crucibles do not stick to pedestal blocks coated with carborundum cement. Others have found that a handful of dry firesand spread over the pedestal block accomplishes the same purpose.

Refractories for Tilting and Rotary Furnaces

In the various types of tilting and rotary furnaces for melting brass, the linings are subjected to severe mechanical as well as thermal conditions. By means of suitable forms, a firesand lining may be rammed in place, and burned in one piece in the furnace at low cost. Some remarkable service records have been made in these furnaces which were lined with firesand. For example, one brass foundry was able to get a maximum of only 240 melts from fireclay shapes or clay ramming mixture. They have recently been using rammed firesand linings and have had 1400 melts on one furnace and similar records on others.

Sometimes a customer does not care to build his entire lining of carborundum, but prefers to use carborundum cement as a furnace wash. For such purpose, the cement is applied with a stiff brush to a thickness of one-half to three-quarters inch. One such case has been reported in which the operator, by taking care of the linings in his furnace by frequently washing with carborundum cement, increased the life of the lining 10-fold. This remarkable increase in life was probably due to the fact that practically no attention was given to the fireclay linings. In another authentic case several furnaces have been operating for more than a year, with only slight repairs every three or four weeks..

Refractories for Feverberatory Furnaces

The refractories in a reverberatory furnace of the type used for reclaiming foundry scrap and for refining other scrap metals are subjected to the most severe conditions. The temperature attained is usually high above that at which fireclay bricks can be successfully used. Recrystallized carborundum bricks used in the arch vertebrae and the lower courses of the sidewalls of one such furnace near Niagara Falls have increased the life of the furnace from six or seven heats per lining to a total of 54 heats. Even in this case the bricks were not destroyed. The piers at the throat of the furnace had been constructed of fireclay bricks, which gave way and allowed the arch to fall. In rebuilding this furnace the entire throat as well as the vertebrae and roof have been installed from the bottom to above the slag line because they have been found to resist the action of the lime fluorspar slag with more than usual satisfaction.

In another scrap-reclaiming furnace in the Chicago district, the carborundum bricks were used around the doors and burner ports, and along the slag line. These bricks have given satisfactory service for 12 weeks and are still in place. At the slag line there is considerable erosion but the longer life and the fact that continuous operation of the furnace is possible, makes them much more economical than fireclay.

The bottom of a number of reverberatory furnaces for melting and final refining (where only slight amounts of slag are encountered) have been built of bonded carborundum shapes and have given satisfactory service. It should be pointed out that carborundum products cannot be used satisfactorily where lead oxide slags are encountered. Lead oxide is one of the best agents known for the decomposition of silicon carbide.

An oil-fired Schwartz reverberatory furnace for melting aluminum was partly lined with recrystallized carborundum bricks in July 1919. The particular advantage of carborundum in this installation was the freedom from slag which was easily removed without injury. The furnace is still in operation, and the bricks are in nearly perfect condition.

There are numerous special applications of carborundum in furnaces in nonferrous metallurgy, but enough has been given to indicate the nature of the applications. While the comparatively high first cost of carborundum refractory material has caused some restriction in its use, nevertheless the general experience of users has been that the economy and satisfaction of uninterrupted operation much more than compensates for this extra first cost.

NEW ZINC ALLOY

A new zinc alloy for bearings is discussed by Heinrich Falkenberg in "Metal und Erz." According to an obstract in "Technical Review," it is known that an alloy consisting of iron 1.6, zinc 94.9 and lead 3.5% is a mixture very suitable for bearings. The production of this alloy requires a melting temperature of 45° C. The product has a crushing strength of 1,740 kilogs, to the square centimetre. Further investigations have shown that a higher temperature, up to 1,000° C., and a corresponding increase in the iron content up to 3%, give a greater resistance to compression strains — namely, 1,620 kilogs. The process of producing this alloy is as follows: In a graphite crucible, 6.5 parts of hard zinc are melted with 3 parts of iron at a temperature of 1000° C., well stirred and the dross removed. To this bath, 3.5 parts lead are added.

F. H. BELL, Editor

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The Question of Strikes

AS WE have always said, we do not take sides on such subjects as strikes, but we can not help taking notice of them. While the working man has the same rights as anyone else and it is his privilege to organize and hold off for the best bargain he can get, it is doubtful if he always uses the best of judgment in going on strike to accomplish his ends. The coal miners' strike which was carried to such extremes in Great Britain is an example of what we are forced to consider as mistaken judgment.

There is probably no man in Great Britain who stands higher in labor circles than J. Havelock Wilson, President of the National Sailors' and Firemen's Union, but Mr. Wilson's ideas of unionism are not those of the radical who is always talking strike for the sake of striking. While delivering his presidential address a few weeks ago Mr. Wilson indulged in some pretty plain talk concerning strikes, particularly the coal miners' strike which his organization was urged to support. Here are some of his remarks:

"If the trades union movement had been wise when the war was ended, it would have made a good compromise with employers to secure industrial peace, but unfortunately, a good many of the laborites lacked the moral courage to preach what they actually believed. Chiefs of the miners' federation had told him that one of the most colossal blunders which labor had ever made was the late stoppage of work in the coal mines. There are many who want turmoil from end to end of the country, but how that is going to help the workers, I cannot understand. Such ideas are those of fools and madmen, which, in no way, reflect the real feelings of the workers."

Such expressions from the president of one of Britain's strongest unions would seem rather harsh, but it is right to the point. If British manufacturers could have been first to secure the world's markets after the great war, instead of waiting on striker's movements, the unemployment among British workmen would be less acute than it is today.

Yet along with this we have a report from the Pennsylvania coal regions which reads like this: "President Lewis of the Miners' Union, in a statement the other day, told the miners that they must be alert and ready to oppose any reduction in their wages. He emphasized this as the chief thing for which the miners must now be strongly organized."

The operators' argument is that to mine a ton of hard coal in 1916 cost them in wages $1.70, while in 1920 it cost them $4.20. The head of the miners' union would, of course, like to have these wages continue and therein lies the problem—are the men standing in their own light if they listen to the advice of their president without carefully studying the consequences?—or would they be acting the part of wisdom by considering Mr. Wilson's views?

While we do not propose to use such language in describing our Canadian workmen as Mr. Wilson used in describing the British miners, we cannot help noticing that they make some serious mistakes from the standpoint of their own good and welfare.

Two years ago last May the iron molders went on strike in the face of an industrial depression when the employers were simply keeping their doors open because they were afraid to close them for fear that the little bit of business which they had would help an opponent to keep open. The strike was a Godsend to them and allowed them all to close at the same time. They did not attempt to fill the shops with non-union men because they did not need them. The foreman and a few laborers would take off an occasional heat. As a result of this strike the molders' union has been badly disorganized, and many of them have been forced to return and work side by side with the laborers who had picked up the trade. The molders see this now and realize that they had been ill-advised by those who should have looked into conditions.

The same can be said of the strike in the job printing offices which is on at the present time in most every part of the American continent. Whether or not the men have a grievance we are not prepared to say, but a more unfortunate season could not have been selected to accomplish results than the present one. With times as they are, strikes would seem to be out of season, and the best that any of us can do is to try and divide up what there is among as many as possible in order to tide over the depression which is already about spent. Better times are already beginning to show themselves and it will not be long until things will be in good shape. Quite a number of the shops are already increasing their forces.

As we pointed out in a former issue, it is gratifying to see that the molders are abstaining from strikes this year, so far as Canada is concerned.

* * *

Conditions Are As We Make Them

WHILE the earth remaineth, seed time and harvest, and cold and heat, and summer and winter, and day and night shall not cease."

This is a divine decree recorded in the first book of Moses, and has, so far in the history of the world, been found to be correct. Then why worry about the times? The earth with its

regular habits is at our disposal and if we make a failure of managing it, the fault rests with ourselves. There is the same demand for things that there has always been, excepting in times of war, and no extra cause to worry. When we say "worry" we must say it with a lot of latitude, as worry is the mainstay of our existence, but we must worry in the right direction. If we read earlier in the same story we learn of the program which was laid out for us—to earn our living by the sweat of our countenances, and not only this but our labors will be rewarded with thorns and thistles along with our useful rewards, so that smooth sailing is not to be looked for. We must strive and struggle against many obstacles if we will succeed.

The easy money which we were receiving as a result of the war and which, by the way, we were just borrowing out of our own pockets at big interest, cannot be repeated. We must get back to normal conditions, or as it is usually termed, a state of "normalcy," and worry along as of old.

The expression "normalcy" is well aired in an article published in "The Dodge Idea," of Mishawaka, Indiana, entitled, "Are You Willing to Worry." The story, in substance, follows:

"Normalcy" is the most abused word in our modern language; certainly it has been booted, muffed, man-handled and maltreated by every known variety of the genus man from the barrel-a-year cross-roads merchant at Hicks Corners to the executives of the largest corporations in the country. Every journalist with a spark of life in him—yea, and every editor too, has taken the word and used it as the basic text for much hot air anent the business and industrial situation.

What really constitutes "normalcy" The writer claims—and he believes this statement will arouse argument—that normalcy is really the willingness to worry. Before exception is taken to this statement let us make one single comparison. What constitutes normalcy in the average family? Let us assume—and the assumption is sensible, I believe, that such normalcy consists in a man being married, raising a family, educating his children, putting aside something for a rainy day, holding down his job, and, in general, being a decent and law-abiding citizen. Now—is there anyone who can truthfully say that all this is accomplished without worry? Scarcely!

Contrast this phase and condition of normalcy with that which presumedly is prevalent in industry today and we find a striking and dramatic contrast. The average executive of any organization—and there are but few exceptions—is unwilling to worry and because of that unwillingness business is wabbling along on a half-portion basis. Show me an organization today that is not trying to speed up production, to cut salaries and to limit purchases to immediate needs and I will show you a whole flock of white black-birds! The average executive today is a modern Dr. Jekyll and Mr. Hyde but he hates to admit it! Visualize, if you will, this individual of odd and composite characteristics. He attends a sales conference and talks to his salesmen. A hand toys with the golden chain draped athwart a well-rounded stomach and he mouths well rounded—and insincere—phrases. He tells his salesmen that there really is no depression; that they can go out and sell the prospect. He is talking pure bunk when he blandly explains to the defenseless salesmen that business is really good and that all they have to do is to go out and place their proposition before purchasing agents and that purchasing agents will begin signing orders with reckless abandon. And the executive knows it is bunk when he is talking; otherwise he's a normal man—*but he doesn't want to worry!*

Let us shift the scene. The executive leaves the sales conference for his office. A frown creases his brow—and he almost starts to worry!—but an idea comes which will eliminate worry, so he gets his chief purchasing agent on the wire and says with finality, "Don't buy a thing!"

The above is a statement of facts; it is almost a verbatim account of what has happened and what is happening today in industry and the very insincerity of it is the thing which is making this depression purely a psychological matter rather than an economic one.

Executives today have lost their ability and their willingness to worry. That is why salaries are being cut, why office forces are being cut to the bone, why advertising appropriations are being limited and why every known method of retrenchment is being used. Just to save the executive from worry! The average executive has had four years of good business, minus worry, and he has grown soft and flabby on it. Time was when a business problem came up and that executive met that problem like a fighting man; he ate, slept and worked with that problem—every hour of waking life was so crammed with that problem that he solved it. But he had to worry some to do it! Not so today; he leans back in his chair and complacently waits for the other fellow to do the heavy worrying, without ever thinking that the other fellow is playing exactly the same game! He can't and he won't worry.

What industry needs today is fighting men at the head of it; men with the ability to analyze and fight—not waiters but go-getters. Industry needs men who will keep purchases of today on a par with the same proportion which existed three years ago between sales and purchases.

Executives whose fighting ability is a tradition should be relegated to the scrap heap or given some post in the organization where their supine attitude toward present conditions will not interfere with the healthy recovery of business to "normalcy" which will only come when new blood is placed in a position of power—new blood with the ability and willingness to worry.

Are *you* willing to worry?

* * *

Canadian Publishers Handicapped

IN AN effort to reduce production costs by getting lower prices on their paper supplies, publishers who ar members of the Canadian National Newspapers and Periodicals Association asked for a conference with paper manufacturers. This conference was held in Toronto on Sept. 8, when the situation was fully discussed. Today some publishers are actually paying more for paper than in 1920, while the ruling price on book paper is 100 per cent. higher than in 1914. In some cases even more than 100 per cent. increase is being paid. Unfortunately no relief is promised by the paper manufacturers. This does not, of course, refer to the grade of paper used by daily newspapers, which is materially lower in price now than in 1920. Publishers of Agricultural, Business, Educational, Religious and Technical Newspapers and Magazines in the United States, all of them in direct competition with Canadian publishers, are today buying their paper at from 25 to 40 per cent. less than the prices paid for paper used in Canadian Foundryman. These U.S. publications are all admitted to Canada free of customs duty.

* * *

Boiler Scale Prevention

A METHOD of preventing scale in boilers is recommended by a Russian engineer, and consists of adding a small quantity of linseed to the boiler water. The linseed is put in the upper part of a copper tank divided by a horizontal sieve of fine mesh and connected with the hot water supply. The resultant decoction, says "Practical Engineer," filters through the close meshed double copper sieve to the lower part, and is fed to the boiler through the injector. The slimy substance of the solution attacks every particle of the forming scale, which does not adhere to the walls of the boiler, and is readily ejected when the boiler is blown out. The necessary amount of linseed is stated to be about half a pound for every 100 horse-power. Taking 30 lb. of steam as corresponding to 1 horse-power, the quantity of linseed required would be about half a pound for every 270 gals. of feed water.

Scraps from The Foundry Scrap Pile

BRAND NEW FOUNDRY OPENS FOR BUSINESS IN BRANTFORD

The Brant Foundries, Limited, a new and flourishing business concern in Brantford is now producing castings, the first heat having been run off since the last issue of this publication. The floor space and cupola capacity call for 10,000 pound heats of light castings, but the first heat which was of 5,000 lbs was most successful, a fact which can not always be depended on in breaking in a new cupola.

This foundry is in reality an auxiliary of the Brantford Scale works, but has capacity to handle much more tonnage than is required for the scale business, the intention being to supply outside customers who require castings of this nature.

Brantford, while being one of the best foundry centres in Canada, has never been in a position to turn out light, soft, grey iron castings, all the foundries being equipped for producing heavy machinery castings.

The Brantford Scale Company was established some fifteen years ago, and manufactures a line of automatic computing scales, cheese cutters, meat slicers, etc., calling for castings which can be easily machined and free from flaws and blemishes, while being of good appearance. To secure these they had to go outside of the city, but now with the new foundry they are in a position to, not only supply their own requirements but to supply a long felt want in the community. This adds one more to Canada's list of up-to-date foundries, and also shows that Canada is not at a stand still.

Mr. L. M. Baldwin, who has been in scale work and metallurgical specialties in the United States, but for some time past with the Brantford Scale Company is in charge of the new plant.

GETS ORDER FROM NEW ZEALAND

The Harley Kay Company, Manufacturers of knitting machinery, Georgetown, Ont., are running full time again. A contract has been signed with the Manawata Hosiery Company of Palmerston, N. Z., to deliver special automatic knitting machines in monthly consignments for a two-year period.

NEW FOUNDRY AT PORT COLBORNE, ONTARIO

Three acres of Port Colborne's industrial site have been sold to Albert Francis of Dunnville who will erect thereon a foundry. A special meeting of the town council was held a few days ago when all arrangements were made with Mr. Francis regarding a railway switch and other matters in connection with the new industry. Building operations will be proceeded with at once and the foundry when completed will be fire proof and of most modern construction.

NEW OXYGEN PLANT AUGURS INDUSTRIAL IMPROVEMENT

In these days of general industrial depression it is refreshing to note the spirit of optimism evidenced in the announcement recently authorized that the Dominion Oxygen Company had broken ground in July for a new quarter-of-a-million-dollar oxygen plant at Montreal, which will double the company's present capacity. The building which is rapidly nearing completion is one hundred feet square and will be substantially a duplicate of the company's Toronto plant, which until now has supplied oxygen to Canadian industrial users through five distinct distributing stations. The Montreal plant will be the second of five producing plants projected at the time the company was organized last year.

IRON MOLDERS ACCEPT REDUCTIONS

A report from the London district has the following to say regarding the foundry business, particularly that of stoves:

"Freemen Felker of Guelph one of the travelling officials of the International Ironmolders Union after a trip through this district believes there is some improvement in trade conditions as they affect members of his union. No stove plate men are out of work and a number of stove-manufacturers have booked a fair amount of business. There are no molders on strike in this district, Mr. Felker claiming it has been their policy to accept necessary reductions in order to help the shops get started. Many of the men have had wage reductions from ten to eighteen per cent in recent months."

I. JOHNSON & SON, PATTERN WORKS MAKE QUICK MOV

Messrs. I. Johnson & Son, patte makers and manufacturers of sn flasks and sundry articles of found equipment, whose works at 1586 Du das St., West, Toronto were so bad damaged by fire on Sept. 24 as to beyond repair have moved to the Nor West corner of the Rumley building Abell St.

The fire while doing a complete jo only delayed operations for two day by which time orders for patterns we being filled from their new quarter They are now fully installed with pra tically the same equipment as befo and with much better facilities f handling material. The new quarte are provided with a large elevator a are well lighted and ventilated. T company is at the present time fair busy.

MAKING CASTINGS DIRECT FRO THE IRON ORE

A novel and unique departure fro the ordinary foundry prac i e is that making automobile castings direct fro the iron ore as is now practised at t new plant of Ford Company at Riv Rouge. The system has been sufficien ly tested to demonstrate its success, it is claimed the seventy-five thousa cars have already been built with cas ings poured already from the blast fur ace.

In the Ford direct method the melte iron is tapped into ladles holding eight five tons each. These enormous ladl are mounted on trucks which are draw on a regular railroad track to the fou dry. Conveyor chains bring the mol past the pouring point and the metal poured directly into the molds. Twent of these conveyor lines are at prese under construtcion.

A second blast furnace is to be i stalled which will bring a great deal the work now being done at the Hig land Park foundry to the River Roug works. The molten metal is of cours analysed and treated with such additio al metaloids as are required before th pouring is done. This necessitates kee ing the metal in a molten state for se eral hours. With the one furnace no in operation, practically all the casting are produced for approximately 4,20 cars per day.

OBITUARY

JAMES MAXWELL

ames Maxwell, President and Gen- l Manager of the firm of Maxwells, ited, manufacturers of farm machin- and hardware specialties, St. Marys, ., died at his home in that town on day, September 30, in his 64th year. Ir. Maxwell was born at Paris, Ont., ere his father David Maxwell car- l on a foundry business for many rs. Some 40 years ago the deceased h his father and two brothers John David moved to St. Marys and es- lished the business of David Max- l and Sons, and manufactured bind- mowers, etc. After the death of id Maxwell, Sr., the business was ried on by the three sons, James, n and David under the name of xwells, Limited. John died a few rs ago, and now David is the only vivor of the original company. John's Lawrence, and David's son, Harold, in the firm. The late Mr. Maxwell a prominent member of the Cana- n Manufacturers' Association, a Lib- in politics and a member of the his widow, one son and one daugh-

JAMES EDWIN FROST

mith's Falls, September 23—James in Frost, sales manager and secret- of Malleable Castings, Ltd., and ctor of the Frost & Wood Company, here yesterday. He was born 58 rs ago, and was a nephew of the Senator Frost. His wife, Laura ghen, predeceased him about a year

ALEXANDER FLECK

ttawa,—The death occured here night of Alexander Fleck, pre- nt of the Vulcan Iron Works. Mr. k was in his 54th year. The foun- and machine business started by Mr. k and his father many years ago nded with rapid strides, branches g established in various cities.

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ananoque Spring and Axle Co., Gan- que, Ont., manufacturers of wagon, gy, and automobile springs and ax- who also operate a foundry for the luction of such castings as they re- e, which includes wagon skeins, are t to instal pneumatic molding ma- es for the wagon skeins and go e extensively into this line of goods.

he Ford Motor Company of Canada, l, Ont., are making inquiries regard- the installation of additional mold- machines which they intend to pur- e in the near future, which fact in- tes an improvement in the auto- ile business.

he Preston Car and Coach Co., Pres- Ont., have sold their plant to the adian Brill Co., a branch of an Am- n concern. The new company will considerably to the plant, and will xtensively into the manufacture of oad and trolley cars and coaches.

CATALOGUES

Metals Coating Company of America, manufacturers and distributors of the Schoop Metal Spraying Process, by means of which metallic coatings of any kind may be sprayed on to any surface, is now in full operation at its new plant, 495-497 N. 3rd Street, Philadelphia, having removed from their former Boston, Mass. and Woonsocket, R. I. locations.

Graphite Lubrication, is the title of a neat booklet published by the Quebec Graphite Company, Buckingham, Quebec, miners, millers and refiners of lubricating flake graphite. The contents describe the different characteristics of one of Canada's leading products, how the flake graphite is separated from the other grades and used for lubricating purposes, while the finer grained portion is used for lead pencils, stove polish, foundry facings, etc. Several views are shown of mines, concentration plant, power plant, etc. All told, it is an interesting, descriptive book.

Northern Crane Works, Walkerville, Ont., are distributing their bulletin No. 504C describing and illustrating their Standard Type E Electric Travelling Crane. The illustrations show the trolley from all angles, as well as various views of the different sizes of crane ranging from 5 ton up to 75 ton. The descriptive matter covers all the details of the different parts, showing how the crane is constructed to guard against accidents, while maintaining efficiency, accessibility, durability and power saving. The bulletin is well worth asking for by those who contemplate installing a crane.

Which Heating System and Why, is the title of a neat catalogue being sent out by Robert Gordon Incorporated, of Chicago. The book sets forth some of the main points to be considered by the owner of a building when he and his architect or engineer undertake to select heating, ventilating or air conditioning apparatus. The details of the Gordon mechanical hot blast heater are illustrated and described for the benefit of those who are undecided as to which system to instal. Heating and ventilating the foundry being one of the most important subjects under discussion of late years, the book is well worth possessing.

W. W. SLY COMPANY EXHIBIT DUST ARRESTER

At the Chemical Societies Convention recently held in New York city the W. W. Sly Manufacturing Co., had a very interesting exhibit in the form of a dust arrester in full operation, which created quite a lot of interest among the visitors. Mr. D. S. Hadley, their N. Y. manager, was in charge.

PIG IRON

The stiffening in pig iron prices contines. The Chicago market has gone up a total of $3 from its recent low point, Buffalo being up a dollar or so. The valley market on foundry is up another 50 cents, or to $20.50, valley, against $19.50 at the low point.

One way of putting it is that pig iron is advancing because freight rates on ore, coke and limestone have not been reduced and may not be reduced for months. Months ago nearly all the merchant furnaces went out of blast, with stocks, and of course they wished to liquidate the stocks as costs were expected to decrease. By and by prices had gone below the current cost of production, but perhaps not below what would be the cost of production when freight rates should be reduced. The condition now, however, is that the stocks are pretty well liquidated and the freight rates are not down. A furnace might sell its stocks at any price, but it would not blow in to make pig iron at a loss.

Connellsville coke prices are plainly defined and it is made clear that reports in circulation in some quarters for some weeks past, as to low prices that could be done, were without foundation. While $2.75 was reported possible on furnace coke, a contract has been made at $3.10, the American Rolling Mill Company buying 9,000 tons a month, September, October and November, from the Hillman Coal and Coke Company, and this is considered the market level. For one month the price might be $3.00, but for delivery beginning October 1 and running through December the price would probably be $3.25. Spot foundry coke remains quotable at $4.00 to $4.50.

WILL OPEN TRADE OFFICE IN INDIA

Montreal.—According to Major Chrisholm, Trade Commissioner for Cuba, Venezuela, Columbia, Panama, Mexico and Jamaica the Canadian Government will open a trade office in India.

Major Chrisholm will leave for Calcutta on October 16th. but will be at the offices of the Canadian Manufacturers' Association, Montreal, from October 5 to 15, in order to meet exporters and those desirous of obtaining information on trade prospects in Central America.

REMOVES TO LARGER AND BETTER QUARTERS

The Toronto, Ontario, Canada, office of the Independent Pneumatic Tool Company has been removed from 32 Front Street West, to No. 163 Dufferin Street, Toronto. This new location will give the Independent Pneumatic Tool Company larger space and increased facilities for carrying a complete stock of Pneumatic Tools, Electric Tools, Spare Parts and Accessories. The Toronto office will remain in charge of Mr. William McRae.

PLATING AND POLISHING DEPARTMENT

Question—I have used sodium chloride as a conducting salt in my nickel plating solution for several years, and have never been satisfied with the bath, but could get no definite information regarding anything better, until recently I read an article on plating, which included a reference to nickel chloride as a conducting salt. Now, it appears to me that nickel chloride should be the corect chemical to use if one wants a chloride in the solution. I have tried several small quantities of solution by adding nickel chloride, and can say I am favorably impressed. Before making additions to the large solution. I wish to enquire how I can make my own nickel chloride, and what quantity to use in a 200 gallon bath?

Answer—Your desire for improved conditions is indeed commendable, and your deductions correct. Where chlorides are not objectionable in a nickel solution, the nickel chloride is the logical salt to use. In nickel solutions containing boric acid, the nickel chloride will permit the use of higher current densities than is possible with sodium chloride, and while any soluble chloride will assist in effecting better anode corrosion, the character of the deposit will be detrimentally affected as compared to deposits from a nickel solution containing nickel chloride. To prepare the nickel chloride you may proceed as is the custom of several well known platers, thus, to any volume of chemically pure hydrochloric acid add plastic nickel carbonate until no action occurs. Test for acidity with litmus paper, if the solution is not absolutely neutral heat to about 80 degrees Fah. for a few minutes, and stir well. Allow to settle and use about ten ounces of the clear green liquid for a 200 gallon bath equipped with 85-87 per cent, nickel anodes, and about 15 ounces for same volume of solution using 92-95 per cent. nickel anodes, and about 20 fluid ounces for 200 gallon bath with 95-98 per cent nickel anodes. This amount is calculated for baths containing 2 oz. of boric acid per gallon, and may be increased in case of single salt solutions using very pure anodes and a higher percentage of boric acid. In the preparation of the nickel chloride solution allow ample space in the container for increase in volume of solution as a result of dissolved carbonate; an excess of carbonate will do no harm, as it will simply settle to the bottom of the container and may be taken off when fresh chloride is required. We would not advise operating nickel baths strongly acid to litmus, when chlorides are used as conducting salt. By proper management you will be able to operate the nickel solution indefinitely without the addition of acid other than boric acid. Some platers are now using hydrochloric acid in place of sulphuric acid, to correct the neutrality of nickel solutions. The practice is not very general, and will require further experimentation before being advised for general practise.

Question—I am anxious to secure information with reference to producing a grey or steel black color on silver plate. The finish desired is similar to the genuine platinum grey seen on expensive silver goods. Ordinary French grey obtained by use of liver of sulphur and ammonia will not give us the effect wanted.

Answer—A solution which is quite generally employed, and which produces a very pleasing antique finish upon artistic silverware, is prepared as follows: Reduce about one ounce of iron sulphate crystals in an evaporating dish with about 1½ ounces of hydrochloric acid and one ounce of nitric acid. When the iron is dissolved, evaporate by heating, to one fifth the original volume. Allow to cool and add one third the amount of alcohol as you have iron sulphate. Transfer to a suitable bottle and keep closely stoppered. To use, apply the solution to the silver with a brush, the operation being carried out with cold solution and without heating the article, as the action is quite rapid. A very pleasing dark brown shade is produced by the cold treatment. If the article is heated the heat causes a red slime to form on the lower surfaces, and by relieving the high lights the finished article has a very beautiful appearance. This solution may be used to obtain almost any tone of color it is possible to get with platinum. It is very inexpensive and has certain advantages peculiarly its own; if the red cast is too pronounced, add a very small pinch of lamp black and thoroughly mix before using.

Question—During the summer months we experienced considerable trouble in avoiding rusting of polished steel during the brief interval between the polishing operation and plating. The rusting is extremely bad during week-ends and much extra work is necessary to remove it. Can you assist us in preventing the continuance of this trouble?

Answer.—We would suggest the use of an oil dip by each polisher. A small can of lard oil or other non-corrosive vegetable or animal oil placed handy for the polisher who immerses the emery cake or tripoli in it prior to each application to the wheel, or use a rag saturated with oil and apply to the wheel occasionally. This will produce an oily surface to the steel or iron, which will resist corrosion longer than the dry surfaces produced when only the polishing compounds are used. In some cases it is necessary to use slack lime on the hands when polishing steel or iron as a neutralizing medium for acid excretions from the hands of the operator, the result being decidedly more serious in warm weather and in factories where the ventilation is poor. We know of one large Canadian manufacturer who sprays all steel goods with coal oil immediately after polishing. This method entails extra labor in subsequent preparation of the goods for plating.

Question—We wish a formula for a solution to clean buffing dirt from nickeled castings, either by simple boiling and swabbing or the electro-cleaning method. Ordinary cleaning solutions fail to soften the buffing compound left on the goods and we have been washing in our nickel with gasoline. This we desire to avoid.

Answer—A strong soap solution used with the electric current will effect a speedy removal of the buffing dirt. Whale oil soap is best for this purpose. 4 oz. per gallon of water made soft by addition of 4 oz. of soda ash per gallon will permit the cleansing to be done in from 30 seconds to 1 minute without tarnishing the nickel deposit. Use the solution at 212 degrees Fahr. and with full voltage of dynamo. A combination of Oakite No. 2 and Oakite plater's cleaner, 4 oz. of each per gallon will also remove the dirt very rapidly. Use same as the soap solution. Some operatiors claim to get greater efficiency from the Oakite combination by adding small quantities of whale oil soap to the solution occasionally.

Question—Would it be advisable to attempt to operate a nickel plating solution warm while contained in an asphaltum lined wooden tank?

Answer—You may operate your nickel solution warm in an asphaltum lined wooden tank if you are careful not to allow temperature of the solution to rise above 80° Fahr. Tack a strip of wood on inside of tank about 2 or 3 inches below anodes, and at least 3 inches above bottom of tank; to this strip tack another so as to form a shelf upon which to lay the lead pipe used for warming the solution. By placing the pipe in this position the slime which is present at the bottom of all nickel baths is not disturbed by the action of the steam pressure. Insulate the coil entering and leaving the tank. Heavy steam hose will suffice for this purpose if tightly clamped to the ends of pipe. If you place a false wooden lining in the tank, leaving room for expansion of wood, you may use temperatures ranging from 80° to 120° Fahr. without injury to either tank or goods being plated. A certain amount of "dead" or burnt asphalt may become loosened and float off on the solution, but this may be removed by skimming and will soon cease to appear. Many progressive platers are using ordinary wooden tanks for warm nickel solutions owing to difficulty in procuring the sheet lead lining at reasonable figure.

Basic Hearth Electric Furnace for Cast Iron

Advantages of Electricity Over Other Fuel, From the Standpoint Of Clean, Sound Metal and Uniform Chemical Analysis

By GEORGE K. ELLIOTT

ALTHOUGH interest in the electric furnace is alive and spreading, the great mass of grey-iron foundrymen are still not well informed about it and look upon the occasional adoption of the electric furnace for such common material as cast iron as either foolish extravagance characteristic of the times, or a display of metallurgical affectation. Decidedly this is not the writer's view, for he believes not only that the electric furnace when coupled with the cupola will gain a widespread use in iron foundries, but also that as it attains this it will prove a bulwark against the alarming tendency of malleable cast iron and steel castings to effect a permanent invasion of a field that by right belongs to grey iron. Such invasion actually began during the war, when all branches of engineering pushed on toward superqualities in metals.

The first published accounts in the United States of a working process for grey cast iron involving the electric furnace were two papers read by the author in 1919. The first use of the electric furnace upon a large manufacturing scale for grey-iron castings was probably in an important metallurgical plant specialising in valves at Cincinnati, Ohio. There, at first, it was used for melting and finding cold charges of pig iron and scrap, but soon the process underwent a metamorphosis, becoming a duplexing one that involved the use of the electric furnace and the cupola in tandem operation, the melting being done in the cupola and the remaining operations in the electric furnace. At this plant both cold-charge melting and the duplexing processes were employed for making grey-iron castings for valves that were to handle power steam of great pressure and high temperature. Some years ago steam engineering reached the point where the staple grades of iron valve castings were unreliable for the service expected. The resultant research discovered that the basic-hearth arc electric furnace of the common types in vogue for steel could produce grey iron of a better quality than any that previously had been commercially attainable. That was over four years ago, and electric furnace processes in that pioneer foundry have been in constant use ever since, and also have spread to other foundries in various widely scattered parts of the country. The duplexing process is employed on the largest scale probably in a pipe foundry that passes over 200 tons of grey iron through the electric furnace every 24 hours.

The purpose of the writer in presenting this Paper is to record for the Institute of British Foundrymen some of the main reasons why the basic-hearth electric furnace has vindicated its use for cast iron wherever attempted with discrimination, and why it is likely to do so in all foundries where practice has shaken off the shackles of the crasser forms of competition, pressing on to that enviable position where extreme quality is the first and only desideratum.

Because the cupola is almost the only furnace for melting iron for castings, a few reverberatory furnaces being exceptions, the electric furnace will have to bear strict scrutiny in comparison with the cupola and show noteworthy advantages over it if it is to gain an entrée into the iron foundry. The present discussion will compare the two furnaces in their chief aspects, developing the proposition that along certain lines the electric furnace is an admirable adjunct to the cupola whose field of uesfulness it materially widens. An increase in the number of electric furnaces in foundries need not necessarily mark a decline in the number of cupolas.

This paper was prepared for the annual conference of the Institution of British Foundrymen held at Blackpool, Sept. 14, 15, 16, 1921, by Mr. G. K. Elliott, who also read a valuable paper on a similar subject at the Philaaclphia Convention of The American Foundrymen's Association in 1919. The reader will note that all reference to temperature is given acording to the Centigrade scale. To convert this into the Fahrenheit scale which is better understood by Canadians, multiply the amount given by nine and divide the result by five and add thirty-two. One hundred degrees C. equals one hundred and eighty degrees F. The Centigrade scale begins at the freezing point while the Fahrenheit scale begins at thirty-two degrees below freezing, which is the Fah. zero. Editor.

No attempt will be made here to describe any of the many current types of furnaces, but rather to treat the subject from the standpoint of process and product. The arc type of furnace is presupposed. Furthermore, the discussion will be limited to the basic process in contradistinction to the acid, although there is recognised the usefulness, mainly for superheating, of the latter. The basic process is so much more flexible, its chemical possibilities so much greater, and, in general, its potentiality in many practical directions so superior, that it is by far the more interesting and valuable.

Preheating, melting, refining, and superheating are, generally speaking, the four major periods of a complete furnace operation, and they shall serve as the outline to this discussion.

Preheating and melting are accomplished in the cupola so admirably that for simple performance of these duties the cupola is without a peer. Its thermal efficiency of probably 40 per cent. looms up impressively in comparison with the probable 12 per cent. of the reverberatory or air furnace and the 25 per cent. of the reverberatory furnace of the regenerative type. The efficiency of the electric furnace is placed at 60 to 80 per cent. with a comparatively high efficiency of the cupola, however, there iscombined a simplicity and cheapness of operation that make it still what probably it always will be—the best and overwhelmingly the most popular furnace for melting cast iron. Occasionally the electric furnace is used for melting cast iron, but the practice is rare and limited to small tonnages of small or intricate castings, automobile piston rings being a typical example. It is almost impossible for the electric furnace to compete with the cupola for simple melting.

It seems established therefore that for all except rare instances the cupola is the best and most economical furnace for melting, and for such its retention should be sought assiduously. One ton of coke properly charged in the cupola will melt as much grey iron as not less than 4,000 kilowatt-hours of electricity in the electric furnace. The cupola cannot well be spared from the iron foundry, and in preserving it we help to create the duplexing process wherein it plays a rôle so important that we can declare that the cupola makes the electric furnace economically possible for cast iron under certain circumstances.

There probably are many foundrymen, experts at handling the cupola, who will dispute any claim that the cupola is a faulty superheater. That the cupola can superheat must be granted, but usually it is to so limited a degree that superheating is not one of its outstanding features. There is good authority for assuming that the temperature at the hottest part of the melting zone is about 2,200 deg. C., but the iron, once fluid, has but a few seconds in which to acquire additional heat before being hurried down through the bed-charge of coke away from the hot zone; terrestrial gravitation is the restraining power to the effective operation of the cupola as a superheating furnace.

Nevertheless, we must agree that frequently and consistently really hot iron is obtained in the cupola through a combination of correct charging and operation, good coke, sufficient but not excessive air blast, and suitable pig-iron and scrap. There is reason to believe that grey irons with high melting point—those containing very little combined

carbon(iron carbide)—are capable of reaching higher temperatures in the cupola than dead-white irons with a high content of combined carbon. Both probably solidify at about 1,150 deg. C., but melt at widely separated temperatures, i. e., about 1,232 deg. or higher for grey irons and 1,150 deg. or less for white irons with nearly all their carbon combined.

Grey iron with only traces of combined carbon will hardly melt at lower temperatures than 1,232 deg. C. It might melt as well over 1,370 deg. C. were it not for the fact that during the preheating period it dissolves considerable carbon, thereby automatically decreasing its melting point. Usually it is between 1,232 and 1.260 deg. C. that the gradually descending melting point meets the ascending temperature causing complete fusion of the iron. There is evidence to indicate that speeding up the heating may cause the temperature to meet the falling melting point further up the scale, causing fusion at a higher temperature.

Since its solidifying temperature is about 83 deg. lower than its fusing temperature, a grey iron may be said to start on its molten career with that amount of inherited, quasi superheat. This is a distinct advantage over a dead-white iron which at the time of fusion has practically none of this seeming super-heat. It therefore we assume that a grey iron after melting at 1,232 deg. C. has a seeming superheat of 83 deg. above the freezing point, and if we compare this with temperatures at which such iron is finally tapped from the cupola, we can estimate with fair accuracy the real and the seeming superheating capability of the cupola.

It happens that the writer has a number of temperature records for molten iron from many sources. These all were made with an improved optical pyrometer of the disappearing-filament type. The apparent temperatures were determined by sighting the instrument upon the stream from cupola or ladle and changing to true temperatures by applying the proper emissivity correction.

A study of these records discloses that in various foundries the temperature of grey iron flowing from the tap-hole of the cupola may range from 1,315 to 1,463 degs. cent. Cupola practice, therefore can be divided into three classes according to the prevailing temperature of the iron produced, the classes being as follows:—

Excellent:—Cupola practice producing iron at 1,426 degs. cent and over.

Ordinary:—Cupola practice producing iron at 1,385 to 1,426 degrees.

Poor:—Cupola practice producing iron at temperatures below 1,385 degrees.

Accepting 1,385 and 1,150 degrees respectively as the approximate melting and freezing temperatures of grey iron, it may be declared from these records that cupolas are superheating grey iron about 83 to 233 degrees above the melting point, or 166 to 316 degrees above the solidifying point, with 236 to 277 degrees above solidification representing the common run of foundries.

An inquiry into the losses of temperature previous to casting produces interesting results. Referring again to our records, we find that the losses given in the following paragraph are fair averages, although it must be clearly understood that the loss of temperature for any of the outlined conditions varies widely under the influence of such variables as volume of the molten stream, size of ladle, temperature of ladle, lapse of time, etc.

Iron flowing down a four-foot cupola spout losses about 14 degs. C. There is an average difference of 38 degrees between the stream of iron flowing into a 5,000-pound reservoir ladle, located at the cupola, and the stream flowing from it. If the iron be poured from ladle to ladle, generally to successively smaller ones, the temperature loss for each transfer is from 38 to 55 degrees. The first mould from a 1,000-pound ladle, filled directly at the cupola, is poured at an average of 55 degrees below the temperature of the iron emerging from the cupola, while the last mould (referring to small or medium size castings) is poured after a loss of 111 degrees. If there was an intermediate transfer from ladle to ladle, the maximum loss represented in the pouring of the last mold may be as much as 165 degrees.

Analysing the whole mass of our data, only a very small bit of which we have displayed here, we find that molten grey iron may drop from 55 to 165 degs. cent. in the time between leaving the cupola and entering the mold. Substracting these losses from the minimum and maximum temperatures given in a foregoing paragraph, it is found that the final temperature at the mold may range from 1,150 degrees, virtually the freezing point, to 1,410 degrees, depending upon the initial temperature and the method of handling the molten metal. The available surplus above freezing, therefore, may range from nil to 261 degrees.

Excepting the maxima, the surpluses are not impressive in the light of the journey that lies ahead in the mold itself. This journey, perhaps cold, damp, tortuous and long, will absorb the most if not all the remaining superheat. If the iron be of the low-total-carbon, low-phosphorus, low-silicon variety, there is reason to fear for the outcome. Will there be heat and fluidity enough left after filling the mold to hold the risers alive and active during the critical period of solidification?

The duties of molten iron do not end with taking the form of the mold, because there still remains the important work of feeding the new-born casting while solidifying, cooling and contracting. For this, fluidity is the needed property. The most powerful factor for fluidity is superheat. However many other elements have a bearing upon it, among which are the contents of phosphorus, silicon and carbon, the freedom from disolved iron oxide and entrained slag, and probably factors concerning which as yet our knowledge is very imperfect. Unfortunately the cupola is not always capable of imparting the needed superheat when facing too many adverse influences in the iron itself and unfavorable conditions in the patterns. At such times the cupola requires exactly the auxiliary that is supplied in the electric furnace. Superheating in the electric furnace can be made so powerful that ample fluidity becomes inevitable.

Strong irons are generally notoriously lacking in fluidity, and must either be limited to castings of heavy sections or be heated to a high temperature before being cast into thin sections. The irons of greatest strength contain only a small amount of phosphorus, which element is one of the most powerful aids to fluidity. In grey iron, phosphorus seriously diminishes strength, by forming a low-melting, brittle eutectic of iron sulphide and iron, sometimes called "steadite," that endows the whole casting with some of its brittleness. The role played by phosphorus in cast iron is important, but in the cupola product it has at times the embarrassing effect of rendering fluidity and strength more or less incompatible. None can gainsay that the cupola owes much to phosphorus. Were phosphorus not present in the great run of foundry irons, the cupola would be far from the effective and popular furnace that it is. If strong irons are low in phosphorus their natural fluidity is low, and has to be augmented by raising the casting temperature, which places upon the cupola a burden it can handle only imperfectly. The electric furnace, on the other hand, can superheat even the lowest phosphorus iron sufficiently to make its fluidity equal to the task of running out perfectly the smallest and thinnest section castings. It throws the whole field of castings open to the so-called non-fluid irons, and should be able to popularise certain exclusive grades of iron.

Not infrequently poor coke is the chief factor in the cupola's failure to superheat. Especially during the war and times of labor shortage and unrest, was good foundry coke difficult to obtain, and consequently the quality of many iron castings suffered greatly. On the other hand, the foundries using the electric furnace in series with their cupola were to a great extent immune from the poor-coke pest. It can be declared that any coke capable of melting pig iron or scrap in the cupola sufficiently for it to be transferred to an electric furnace can be used with impunity in the duplexing process, because its shortcomings are set right in the electric furnace. However, it must not be forgotten that good coke is always desirable for the duplexing process, because coke is cheaper than electricity, every extra degree of heat gained in the cupola be-

(Continued on page 44)

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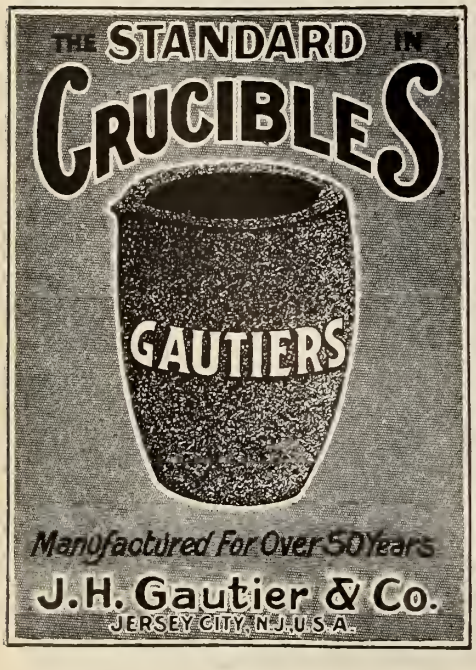

BASIC HEARTH ELECTRIC FURNACE FOR CAST IRON

(Continued from page 42)

ing money saved in the electric furnace. The electric furnace must not be permitted to set a premium upon bad cupola practice. It overcomes the cupola's deficiencies only at a cost, and after all the best idea of the duplexing process is a perfectly operating cupola delivering its best product for the briefest possible treatment in the electric furnace.

We have seen that the practical temperature limit for grey iron in the cupola is not far above 1,454 degs. cent., while the general average is much lower. However, once the iron is transferred to an electric furnace, progressively higher temperatures become merely a matter of time and electricity, and the foundrymen is left to decide if the expenditure is justified by results. With molten iron delivered to the electric furnace at 1,343 degs., the current necessary to superheat to 1,510 degs. with incidental refining approximates 200 kw.-hours per ton of metal, varying with the size of furnace.

For most purposes the limit for superheating grey iron in the electric furnace may be set at 1,510 degs., although when needed higher temperatures are readily attained. There is nothing gained by excessive superheating unless it be when a more thorough cleansing of the metal is needed. A temperature of 1,560 degs. in the iron delivered by the electric furnace represents a working margin of about 351 degs. above solidification, and depending upon the method of handling gives a surplus ranging from 194 to 305 degs. at the mold. If the iron be poured thus, the molds may require more refractory sand, and certainly there will be need of better-built molds than often are made if an undue number of run-outs is not courted. For non-fluid irons and very small castings or castings with thin sections this working margin is of inestimable value.

The subject of hot iron can hardly be dismissed without reference to liquid contraction, which name was given by Longmuir to the local contraction that occurs in the heavier parts of a casting immediately subsequent to the solidification of the outer surface. The relation of this phenomenon to casting temperature is most intimate, and several investigators, among whom is Hailstone, have demonstrated that grey iron cast at temperatures in the vicinity of 1,426 degs. cent. has every chance of being solid, of close grain and maximum strength; cast at medium temperatures, about 1,343 degs., the grain is more open and the strength less, while cast at about 1,300 degs. and lower, blow holes appear and liquid contraction cavities are common. If this work be accepted it places the avoidance of liquid contraction within the province of electric-furnace iron, since casting at 1,416 degs. will often mean a metal temperature at the furnace of 1,482 degs. or over.

The peculiarly interesting feature of the basic hearth electric furnace is its refining power. This operation is almost unheard of in the average iron foundry, where at times a simple process of mixing, and consequent dilution of impurities, may be said to take its place. In some high foundry circles the idea of refining is not so much overlooked as religiously avoided. When first proposed, the idea of refining in the electric furnace was tersely rejected by several eminent foundrymen with the comment that one is not looking for refining operations in the iron foundry, because refining means oxidation. Their complete conversion was immediate, however, when it was made clear that refining in the electric furnace means deoxidation and not oxidation.

At all events, the cupola is not a refining furnace, whereas the electric furnace with basic lining emphatically is. This furnace, with its unlimited capability for the production of heat, its reducing atmosphere, its reducing and intensely reactive slag, and its ready adaptability, is the refining furnace par excellence. For refining, it is the opposite of the cupola and the most potent of all furnaces.

(To be continued next month)

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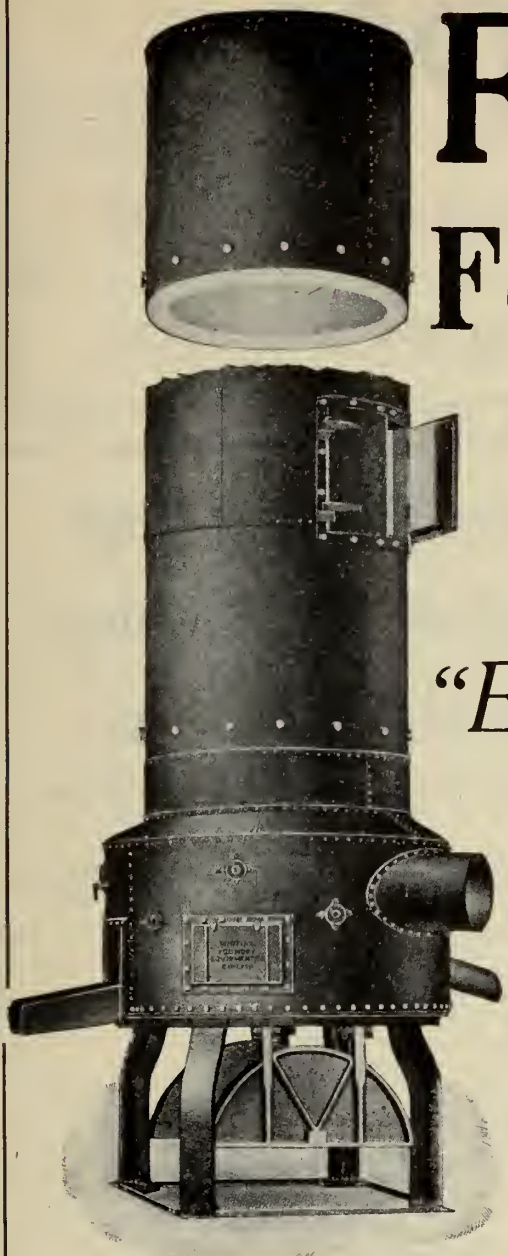

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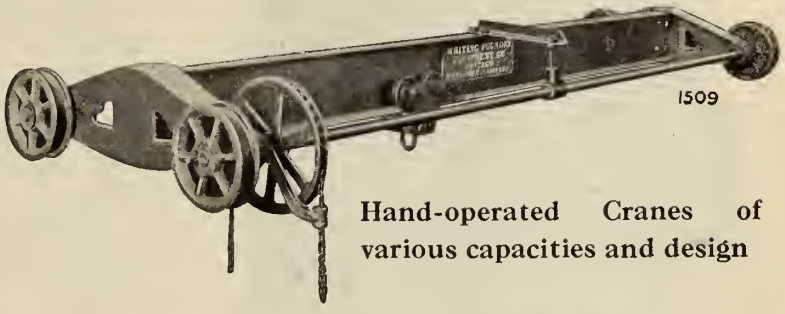

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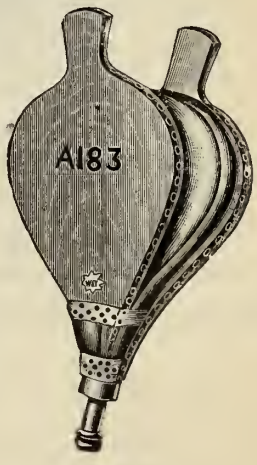

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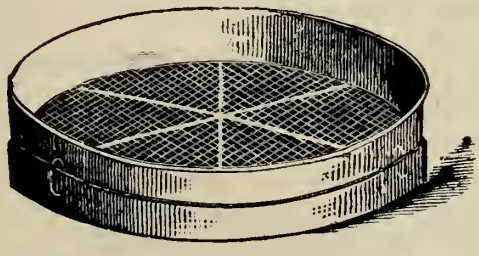

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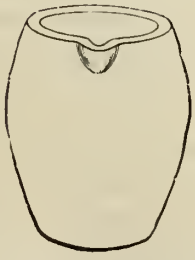

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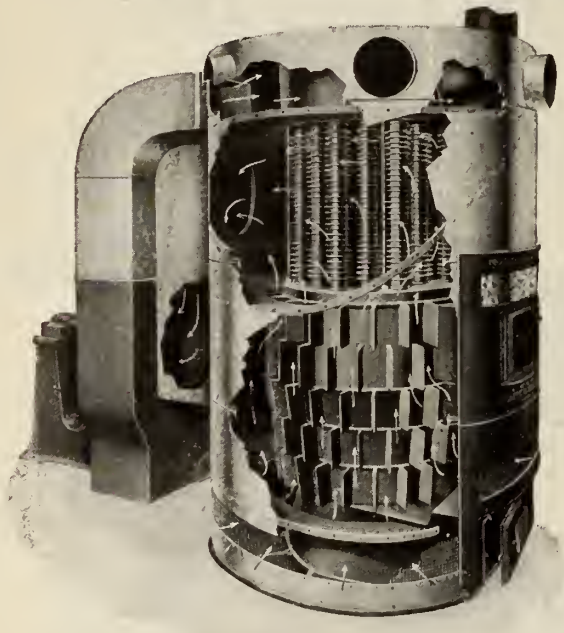

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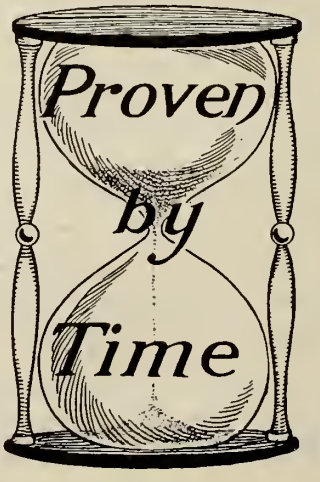

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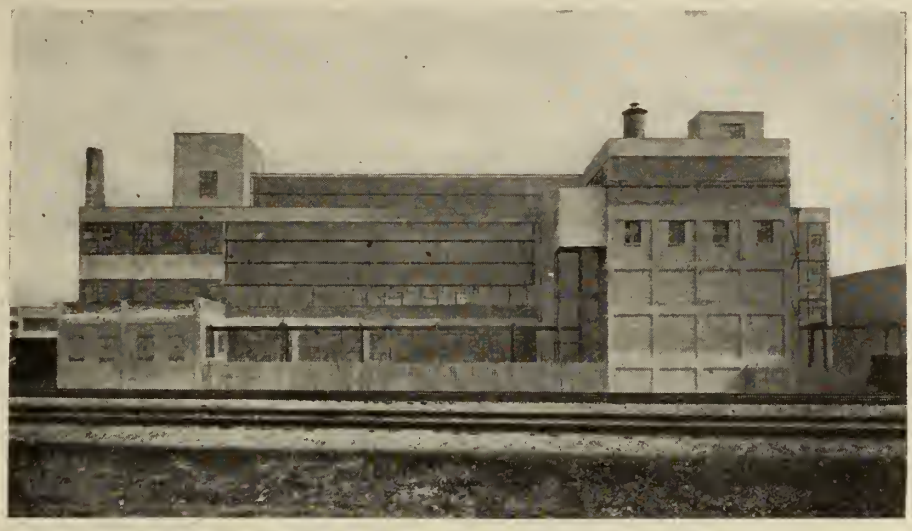

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Hawley Down Draft Furnace Co., Easton, Penn.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich
Whitehead Bros., Co., Buffalo, N.Y.
Woodison, E. J. Co., Toronto, Ont.

FURNACES, BRASS
Campbell-Hausfeld Co., Harrison, Ohio.
Volta Mfg. Co., Welland.

FURNACES, ELECTRIC
Electric Furnace Construction Co.

GLOVES ASBESTOS, DUCK AND LEATHER
Frederic B. Stevens, Detroit, Mich.

GOGGLES
King Optical Co., Cleveland, O.

GRAND ROTARY SAND RIDDLE

GRAPHITE GREASE
Pettinos, George F., Philadelphia, Pa.

GRAPHITE PRODUCTS
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Frederic B. Stevens, Detroit, Mich.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Pettinos, George F., Philadelphia, Pa.
Woodison, E. J. Co., Toronto, Ont.

GRINDERS, CORE
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
Wadsworth Core Machine & Equip. Co., Akron, Ohio.

GRINDERS, PNEUMATIC
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL POST, FLOOR AND BENCH
Holden Co., Ltd., The, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE (PNEUMATIC)
Cleveland Pneumatic Tool Co., The,
Holden Co., Ltd., The, Montreal.

GRINDERS, RESIN
Frederic B. Stevens, Detroit, Mich.
W. W. Sly Mfg. Co., Cleveland, Ohio.

GRINDING PANS
National Engineering Co., Chicago, Ill.

GRINDING WHEEL DRESSERS
Oliver Machinery Co., Grand Rapids, Mich.

GRIT ANGULAR
Pangborn Corporation, Hagerstown, Md. U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GRIT STEEL
Pangborn Corporation, Hageratown, Md., U.S.A.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

HAMMERS, CHIPPING, CAULKING PNEUMATIC HOSE
Independent Pneumatic Tool Co., Chicago, Ill.

HEATING
Skinner Bros. Mfg. Co., St. Louis, Mo.

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Holden Co., Ltd., The, Montreal.
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HOISTS, HAND, TROLLEY
Northern Crane Works, Walkerville.

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E. J. Woodison Co., Toronto, Ont.

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Steel Co. of Canada, Hamilton, Ont.

IRON CEMENTS
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Woodison, E. J. Co., Toronto, Ont.

IRON FILLER
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Woodison, E. J. Co., Toronto, Ont.

IRON SAND
Globe Steel Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JOLT MACHINES AND SQUEEZERS
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Grimes Molding Machine Co., Detroit, Mich.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.

KNIFE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

LADLES, FOUNDRY
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Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer Co., S., Chicago, Ill.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Trussed Concrete Steel Co., Walkerville, Ont.
Woodison, E. J. Co., Toronto, Ont.

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Monarch Engineering & Mfg. Co., Baltimore, Md.

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MILLING MACHINES
Ford-Smith Mach. Co., Ltd., The, Hamilton, Ont.

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Pettinos, George F., Philadelphia, Pa.

MINING AND QUARRYING MACHINERY
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Woodison, E. J. Co., Toronto, Ont.

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National Engineering Co., Chicago, Ill.

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Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Brockville Moulding Sand Co., Ltd., Brockville, Pa.
Woodison, E. J. Co., Toronto, Ont.
Venango Sand Co., Franklin, Pa.

MORTISERS
Oliver Machinery Co., Grand Rapids, Mich.

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The Cleveland Osborn Mfg. Co., Cleveland, O.
Dominion Foundry Supply Co., Ltd., Toronto, Ont.
Grimes Molding Machine Co., Detroit, Mich.
Hamilton Facing Mill Co., Hamilton, Ont.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

SAND RAMMERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., The.

NITROGEN
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Frederic B. Stevens, Detroit, Mich.
Pangborn Corporation, Hagerstown, Md. U.S.A.

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Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J. Co., Toronto, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Woodison, E. J., Co., Toronto, Ont.

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Sterling Wheelbarrow Co., Milwaukee.

PIPE
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PIPE, BLACK AND GALVANIZED
Crane Ltd., Montreal.

PIPE JOINTS COMPOUNDS
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PHOSPHORIZERS
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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Trussed Concrete Steel Co., Walkerville, Ont.
Wadsworth Core Machine & Equip. Co., Akron, O.

PLATES, STEEL CORE DRYING
Wadsworth Core Machine & Equip. Co., Akron, O.

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Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilon Facing Mill Co., Hamilton, Ont.
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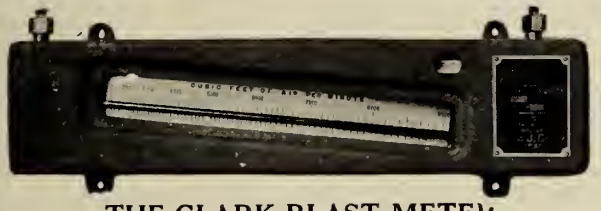

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Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

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National Engineering Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

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Pangborn Corporation, Hagerstown, Md., U.S.A.

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Wadsworth Core Machine & Equip. Co., Akron, O.

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National Engineering Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.
Woodison Co., E. J., Toronto.

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Hamilton Facing Mill Co., Hamilton, Ont.
Hyde & Sons, Montreal, Que.
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Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto. Ont.
Venango Sand Co., Franklin. Pa.

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Holden Co., Ltd., The. Montreal.

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Woodison, E. J., Toronto, Ont.

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Woodison, E. J. Co., Toronto, Ont.

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Hamilton Facing Mill Co., Hamilton, Ont.

WINDOW SASH
Holden Co., Ltd., The, Montreal
Trussed Concrete Steel Co., Walkerville, Ont.

WINDOW SCREENS
Holden Co., Ltd., The, Montreal.

WIRE, WIRE RODS AND NAILS
Steel Co. of Canada, Hamilton, Ont.

WOOD LATHERS
Oliver Machinery Co., Grand Rapids, Mich.

WOOD BORING MACHINES
Holden Co., Ltd., The, Montreal.

WOODWORKING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.
Preston Woodworking Machinery Co.

WOOD TRIMMERS
Oliver Machinery Co., Grand Rapids, Mich.

WOODWORKERS' VISES
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Stevens Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont

NO 7 **SCARFE'S** CORE OIL

The best substitute for higher priced Linseed Oil, -no longer time required- and it is cheaper to bake.

Scarfe's No. 7 is a good strong oil used in proportions—50 to 1—with lake washed sand; it has a breaking strength of 22 lbs. per square inch.

SPECIAL—Send us a sample of the sand you use. We will submit a core oil to give you better results.

SCARFE & COMPANY LIMITED
Makers of Industrial Varnishes and Paints for 44 years.

Head office: BRANTFORD, ONT. Branches: MONTREAL - WINNIPEG

Patterns!

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Put your pattern problems in our hands. Quality work and prompt service assured. Patterns made for all foundry purposes—wood and metal, models and aluminum plate work.

The A. J. HAMILTON PATTERN WORKS
120 Adelaide Street West, Toronto

PATTERNS
in Wood and Metal

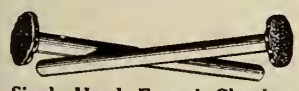
The Downer Pattern Works

265 King Street, W.
Telephone Adel. 6173

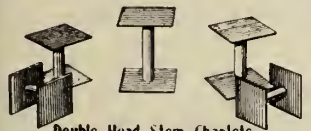
OUR WORK IS GOOD AND OUR PRICES RIGHT
HAVE US MAKE YOUR PATTERNS

TORONTO

FOUNDRY CHAPLETS MADE IN CANADA


Single Head, Forged Chaplets

Single Head, Plates Fitted Chaplets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PHONE 5150

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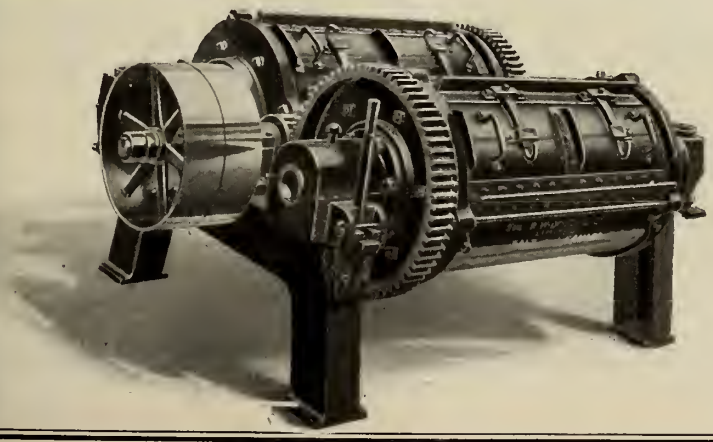


EXHAUST TUMBLING MILLS BUILT IN DOUBLE FILE

Constructed in the same efficient manner as all other McDougall products.

Each Mill may be run separately, which proves a decided advantage when filling or emptying.

Properly protected Ring Oiling Bearing.

Guaranteed for Long, Continuous, Satisfactory Service.

THE R. McDOUGALL CO., LTD.
GALT, ONTARIO

VENT WAX

BUFFALO BRAND

Eliminates "blowing" of cores

No wires or cords to loosen the sand. Absorbed by the core, leaving a clean, unobstructed vent hole. Buy it at your supply house.

United Compound Co.
228 Elk St. Buffalo, N.Y. U.S.A.

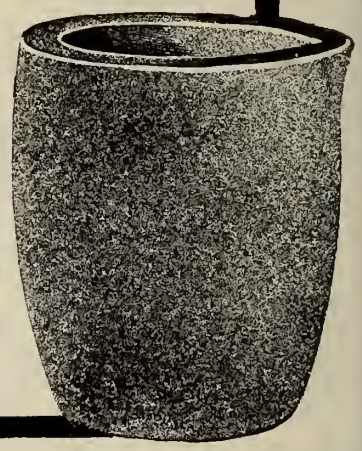
DIXON CRUCIBLES

For Over Ninety Years the Standard

The experience of nearly a century of crucible manufacture is spun into the walls of every Dixon Crucible. Constant checking against this lengthy experience has given Dixon chemists an expert knowledge of the clays, graphite and other materials that go to make up crucibles of the utmost reliability and service.

Result — foundries specify Dixon Crucibles knowing that there are none better made.

Send for Booklet 27A, which gives valuable data on crucible types and sizes.



Joseph Dixon Crucible Company
Jersey City, N.J., U.S.A.
Established 1827
Canadian Agent:
Canadian Asbestos Co.
60 Front St. W., Toronto

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A Good Line to Hook On

There is a certain rule of acquaintance that causes us to like to walk and talk with people whom we know; that also makes us like to get back home at vacation's end.

If you have found–as I believe you have–my line of FOUNDRY FACINGS and Foundry Supplies "a good line to hook on," then that acquaintance will warrant the further mention of my line of Buffing Compositions and Platers' Supplies manufactured by me and wherein the same careful scutiny is exercised. Some of them are:

Stevens Tripoli Compositions

There is concentrated energy in these—"every particle a cutting article."

Stevens Union Maid White Polish

This goes to make the "looking glass finish" so much desired.

Stevens White Columbia Coloring

That gives to brass the glory of gold. It "makes a finish that won't diminish."

Foundrymen who operate an Electro-Plating or Polishing Plant can combine both of my lines of foundry and Plating-Polishing Supplies and find them worthy to "hook on."

Frederic B. Stevens

Manufacturer of Foundry, Electro-Plating and Polishing
Supplies and Equipment
Cupola Blocks, Fire Brick and Clay

Corner of Third and Larned Streets
DETROIT, MICH.

CANADIAN BRANCH: Windsor, Ont.

Canadian Foundrymen Have Discovered Two Things

NOTE—there are no legs on the Comb's Riddle to get in the way of the shovel. Run a wheelbarrow right under it. One of the many features that appeal to Canadian users.

A Better Job at Less Cost

Absolutely Necessary to Make a Sand Riddle Really Efficient

THE first is PORTABILITY. To get the most from a riddle it must be quickly transported where needed. THE COMB'S RIDDLE weighs but ninety pounds and a man can easily lift it. When suspended on a wire it can be quickly moved back and forth to supply as many as twenty moulders. The second is GYRATORY MOTION. This motion is easiest on a machine, every part gyrating in a circle with no stops, starts or jerks. It lessens repair bills wonderfully.

The Comb's Riddle is the Only Canadian Riddle so Constructed!

COMB'S GYRATORY FOUNDRY RIDDLE

This time-saving machine can be hung from anything in any part of the building that will support its weight. It is attached to any ordinary lamp socket. A turn of the switch and it is ready for action. And how it works! It sifts sand faster that one man can shovel into it and screens more sand than ten labourers using hand riddles.

In addition the COMB'S RIDDLE mixes as well as sifts. This saves one turning of the sand. Equipped with a patented, fast-dumping sieve and a one-sixth H. P. motor that makes power costs almost negligible.

Made in Toronto, Ont. Ready for prompt shipment. Don't delay getting the facts. Write to—

Great Western Manufacturing Company, LEAVENWORTH, KANSAS

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

Vol. XII | Publication Office, Toronto, November, 1921 | No. 11

MAY WE SEND YOU A COPY?

YOUR ATTENTION IS DIRECTED TO THE NEW ISSUE OF OUR ILLUSTRATED **CATALOGUE** COPIES OF WHICH WILL BE READY FOR DISTRIBUTION TO THE TRADE ABOUT **NOVEMBER 30**

WE CARRY ON HAND THE LARGEST ACTIVE STOCK IN OUR LINE

BUFFS, BUFFING WHEELS

(ALL KINDS)

NICKEL ANODES 90-92% 95-97% GUARANTEED

POLISHING COMPOSITIONS and ROUGES
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FULL LINE OF PLATING AND POLISHING EQUIPMENT
"WYANDOTTE" CLEANING PRODUCTS

PROMPT SHIPMENTS
DEPENDABLE MERCHANDISE
TO-DAY'S CORRECT PRICES

Suggestion: Have Our Engineer Check up Your Equipment for Better Production

Foundry Supplies and Equipment

Crucibles

Pure Nickel Shot

Sodium Cyanide

WE SOLICIT THE PRIVILEGE OF PLACING AT YOUR DISPOSAL THIS READY REFERENCE AND PERMANENT DISPLAY OF HOW COMPLETELY WE CAN SERVE YOU.

George W. Kyle & Co., Inc.

GRAND AND THOMPSON STREETS

NEW YORK

KAWIN SERVICE

"Building from the Ground up"

Drop us a line and we will be pleased to explain KAWIN SERVICE more fully. It will in no way obligate you.

IT has always been a logical theory that where an automobile has been built "from the ground up" it can't help being a mighty fine car. The reason of course is that every part is constructed with regard to its relationship to the other parts.

Where a foundry is planned, built and operated according to definite pre-established methods the same is bound to hold true.

These established methods you can use in the form of KAWIN SERVICE—an organization of highly trained men giving you all the benefits gained from 20 years practical experience with foundry problems of every kind.

Think what this means to your business. It means that when you want alterations or new equipment you are guided by the most approved methods known to foundry practice. It means that at all times you have expert advice on up-to-date cupola practice, on the economical purchase of raw materials, on the chemical analysis of your mixtures—in fact on every subject that may arise.

Can you afford to be without this valuable advisory service? So successful has Kawin been with other foundries that you are guaranteed a 100 per cent. saving over and above the cost of Kawin Service.

Chas. C. Kawin COMPANY

307 Kent Building, Toronto

Chicago, Ill. Cincinnati, O. Buffalo, N.Y San Francisco, Cal.

Chemists--Metallurgists Foundry Engineers

Twenty Years Experience

in the fire brick business has taught us that no one fire brick is adaptable for all purposes. The one and only reason for choosing a fire brick should be *adaptability to your work*. The matter of cost is of secondary importance. Our

FIRE BRICK

is selected from widely different localities and every brand is specially suited for some special service. You can get best results by telling us what kind of work you wish to use the brick for and let us submit prices. Special bricks for the following purposes.

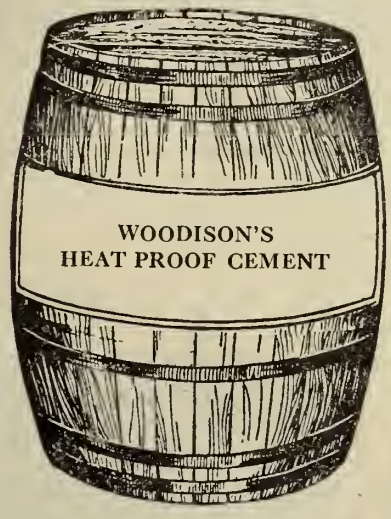
For Re-building Core Ovens; For Re-placing Boiler Settings; For Re-lining Oil, Malleable, Brass or Heat Treating Furnaces

Don't be buncoed into using a cheap brick. Replacement costs come high these days. All shapes carried in stock. See us now.

Need Fire Clay?

We have a very refractory clay, especially adaptable for Cupola Linings, middle inwalls of Blast Furnaces, Hot Blast Stoves, Boiler Linings, and similar purposes requiring not only a highly refractory Brick, but a toughness that will give long service under the abrasion incident to this class of work.

We can supply Canisters for use with Clay to Daub Ladles, Cupolas and Furnaces.



Increase the life of Refractory Walls with our HEAT PROOF CEMENT

This is a plastic asbestos compound—absolutely impervious to heat. Anyone can apply it. Is just like ordinary fire clay mortar, but sets hard as a rock and preserves walls much longer than fire clay. Used for Boiler Settings, Bridge Walls, Boiler Arches, Heat Treating Furnaces, Brick Kilns and for many other purposes.

Get Our Prices Now!

The E. J. Woodison Company, Limited

Foundry Requisites, Fireclay, Firebrick and Equipment

TORONTO, ONT. MONTREAL, QUE.

Sterling

The Institution That Experience Built

An ever growing volume of business—an ever increasing number of repeat orders—are facts that convince us that it pays to furnish the best steel flask plus the advice that our many years' experience makes possible. We are the oldest steel flask manufacturer and the only makers of *rolled* steel flasks.

We have learned that it pays to decline to quote where we have a doubt that the particular size or style desired will give satisfaction.

Our slogan is "Every buyer a satisfied customer."

We have a place on our list for *you*.

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STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

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MONARCH FURNACES

Tilting Crucible Coke Furnace

They Mean a Genuine Cut in Production Costs

If it is a crucible furnace you desire, then you cannot make a better selection than the **Monarch Coke Tilting Crucible Melting Furnace.** It is a reliable, fast and economical melter—equipped with hopper feed and shaker grates. Rests above ground and built for various size crucibles.

Then for non-crucible melting you cannot afford to overlook the efficiency and economy of the **Monarch Rockwell** line illustrated below. They burn oil or gas fuel.

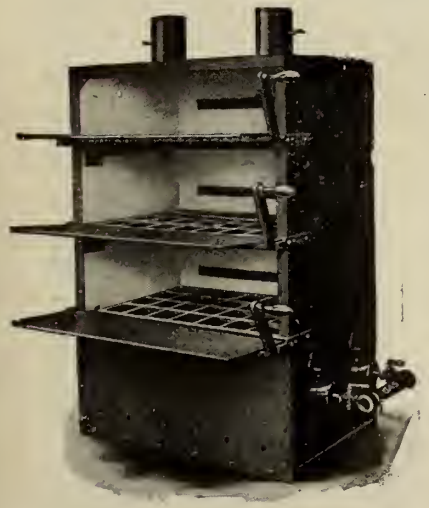
The Monarch Rockwell Double Chamber Melting Furnace melts almost twice as much metal as any other furnace because it utilizes all the heat from its one burner. While melting in one chamber exhaust heat brings the metal in the other chamber to the melting point.

Monarch Single Chamber "Simplex" Furnace is built on the same lines as the double chamber furnace but without its continuous heating capacity. Best fuel economizer of its kind.

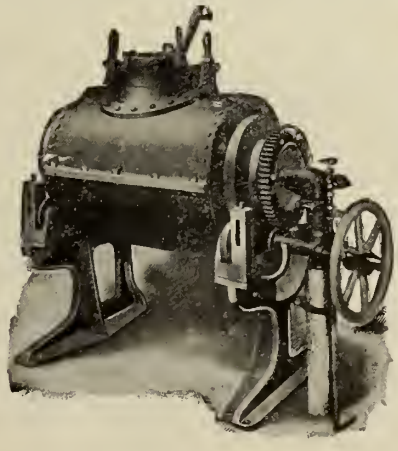
MONARCH spells better results—whether it be with melting Furnaces, core ovens or other foundry equipment. Send for description of the Monarch line.

The Monarch Engineering & Mfg. Co.

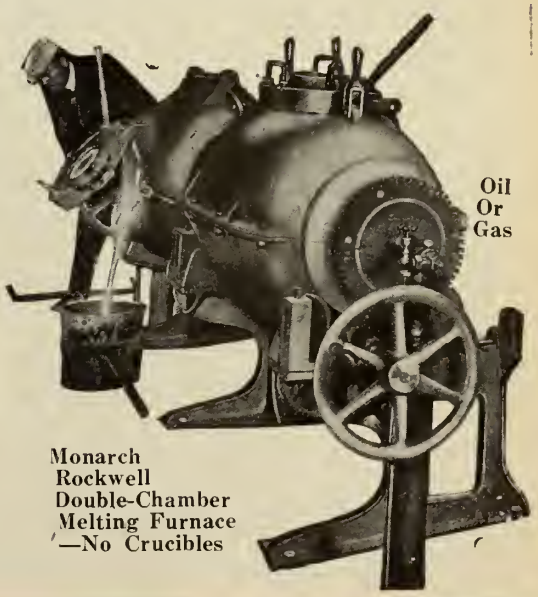
1206 American Building, Baltimore, Md., U.S.A.
SHOPS AT CURTIS BAY, M.D.



Monarch "ARUNDEL" Drop Front Core Oven—Any Fuel



Oil or Gas
MONARCH - ROCKWELL SIMPLEX---*No Crucibles*



Oil Or Gas

Monarch Rockwell Double-Chamber Melting Furnace —No Crucibles

Let's Get Down to Business

SUMMER, with its dog-days, its vacations, its distractions, is over. We have had our holidays, our rest, our recreation. The Fall season, with its new opportunities for effort, enterprise and achievement, is upon us. Let us rip off our coats and get down to business. We may have allowed pessimism to grip us during the stagnant months of Summer. We may even have allowed laziness to enter our blood and our bones. It is now up to us to throw off both lassitude and pessimism. The time has come for action, for aggressiveness, for enterprise, for courage, for daring. Strong men make opportunities. Strong men do not supinely submit to conditions; they mold them. The business roadway has been cleared of almost all the weeds and rocks and swamp; begotten by the fatal war boom. The way is now open for a vigorous forward march. Let us cease looking backwards, let us cease bemoaning the hardships and the distress of the recent past. Let us look forward and let us go forward with confident unhesitating tread. Better times are within our reach if we will but reach out intelligently towards attaining them.—*Forbes.*

Valvular Tank Trouble

WHEN oxygen tank valves leak—in transit or in operation—dollars are dissipated in the air instead of being pocketed by efficient welding or cutting work at the blowpipe tip.

Dominion Oxygen cylinders—like the product—are perfected in every detail. The Wedge Valve on a Dominion Oxygen tank cannot leak. It is the evolution of years of painstaking study, both in design and structural material.

Forged from bar stock, it resists the wear and tear of internal friction and if foreign matter, by any chance, score the face the valve re-seats itself while the tank is fully charged and in operation — a unique time and money-saving feature. And a twist of the fingers is all that is necessary. No tools are required.

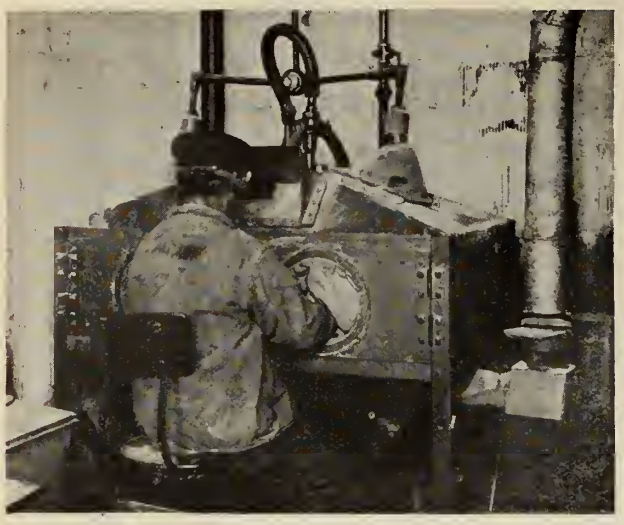
This insurance against interruptions and failures has commended itself to all users of Dominion Oxygen. It also means that Dominion Oxygen reaches the consumer free from impurities and with cylinders filled to capacity—there can be no leakage en route or in application.

And with six centrally located distributing stations in full operation, the Dominion Oxygen Company, Limited, is prepared to supply consumers with any quantity of uniformly pure oxygen anywhere. Our policy of filling all orders on the day of receipt means the quickest and most satisfying oxygen service in the Dominion.

Dominion Oxygen Company, Limited

Hillcrest Park, Toronto

Hamilton Montreal Welland Windsor Merritton D19



SLY SAND BLAST EQUIPMENT

Sandblast Cabinets

of every description and for every conceivable purpose.

The Cabinet shown in the illustration is best adapted for sandblasting intricate work, light enough to be handled and held by hand under the stationary sandblast nozzle.

A Cabinet similar in construction to the above but with a hand operated nozzle is used to better advantage on heavier and larger work that could not be conveniently handled under a stationary nozzle.

For work such as engine castings, crank cases and the like, a Turntable Cabinet is of considerable advantage. Instead of doors for bringing the work into the housing for sandblasting, this cabinet has a turntable with grated top, half inside and half outside of the cabinet. The pieces to be cleaned are placed on the outside half of the table; the latter is then given one half turn which places the work into the cabinet and leaves the other half of the table for receiving additional work.

Cabinets for Steel Rods, Tubing, Bath-tub Castings, Steel Bands, Glass Ware, Pottery, Etc.

The W. W. SLY MFG. CO.

New York, Chattanooga, Birmingham, Paris, France

Main Office and Works: Cleveland, Ohio

Chicago, Detroit, St. Louis, Los Angeles

Representatives for Quebec and Maritime Provinces:
WILLIAMS & WILSON, LIMITED, MONTREAL, QUE.

The SLY Line of up-to-date Foundry Equipment

Steel Tumbling Mills
Iron Cinder Mills.
Brass Cinder Mills
Resin Mills
Sand Blast Mills
Sand Blast Mills—Tilted
Exhaust Fans
Sand Blast Rooms
Sand Blast Cabinets
Sand Blast Rotary Tables
Dust Arresters
Cupolas
Core Ovens
Core Sand Reclaimers

The Master Flask

Stamped with the "Diamond" trade-mark. Master Flasks are a production asset to every molding floor. They are speedy, durable, accurate, light in weight, easy to handle and wonderful economizers of floor space.

DIAMOND

See that the "Diamond" trade-mark is on your next flasks. It means longer service.

Sold in Canada by

Dominion Foundry Supply Co.; Whitehead Brothers Company; E. J. Woodison Company; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

DIAMOND CLAMP & FLASK CO.
40 N. 14th Street, RICHMOND, INDIANA, U.S.A.

Sand *plus* Service

When you Specify

VENANGO
MOLDING SANDS

The highest Quality Sand found anywhere plus a Service Department that analyzes and fills each order with scrupulous care---that's Venango.

Molding Sands for Steel, Malleable, Brass, Aluminum, Furnace and Light Grey Iron Castings. Also Core Sands.

Ask any user about Venango Sands. He will tell you our prices; quality and prompt deliveries relieve him from all sand worries. Send for samples now.

VENANGO SAND CO.
FRANKLIN, PA.

A Damp Core Oven *Can't* Wear Out

The Damp All-Steel Welded Core Oven

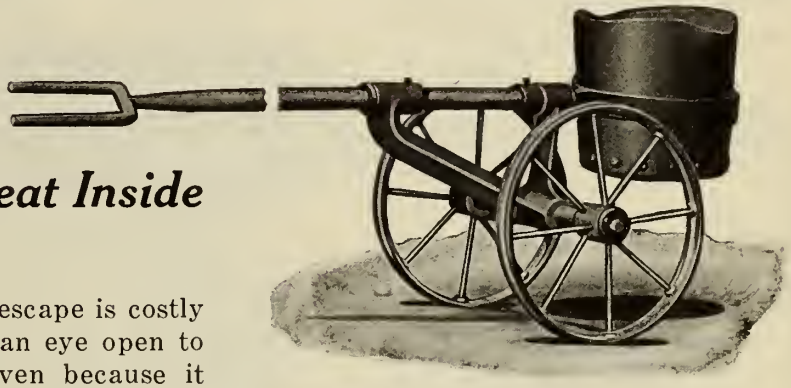
The Grids Are Built of Welded Steel!

If these grids should warp they can be easily straightened. This enables the DAMP Core Oven to last practically as long as your foundry. Ordinary Ovens have cast iron grids which soon warp and break.

Heats Quickly-- Keeps All the Heat Inside

A core oven which allows heat to escape is costly at any price. Foundrymen, with an eye open to economy, like the Damp Core Oven because it keeps all the heat **inside!** When the doors are opened as in illustration a baffle plate at the back of the shelf closes the opening preventing loss of heat.

This is a big point to keep in mind. But running a close second to it is the fact that DAMP Ovens are all-steel constructed and welded throughout. Do you grasp the full meaning of this statement? It makes one investment a life investment, with available facilities for instant repairs.



Why not talk it over with us?

We build for our customers Sulky Ladles like the one shown above. Any style or size made to order. Our products are welded throughout and give long service.

Our products sell lower than jobbers' prices. Ask for prices on Ladles, Steel Bands, Shanks, Core Plates, Wooden Snap Flasks, Slip-Over Jackets.

DAMP BROS Manufacturing & Welding Co.

852 Dupont Street, Toronto, Ontario

I. JOHNSON & SON LIMITED

Pattern Makers

Fully equipped and in position to supply all foundry supply needs without delay

Will take care of all special requirements in highest class lumber, woodwork, etc.

Expert Pattern Making in Wood, Metal, Gate and Plate Work

Let us know your needs for

Snap Flasks
Spruce Moulding Flasks
Hardwood Mallets
Wedges
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Buy Made-in-Canada Products

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GEO. F. PETTINOS
FOUNDRY SUPPLIES
PHILADELPHIA

SAND

DON'T EXPERIMENT—BUY OUR SAND. Years of successful application to their various uses have proven they are unexcelled in quality and uniformity. We have all grades—Strong Silica, Sharp Silica, Lumberton, Albany, White Washed Silica, Fire Sand, Blast Sand, and Genuine Millville Gravel.

Also

PLUMBAGO FOUNDRY FACINGS.

George F. Pettinos

Real Estate Trust Building - Philadelphia, Pa.

Send your orders and inquiries to our

Canadian Representative: R. J. Mercur & Co., Ltd., Montreal

SIMPSON

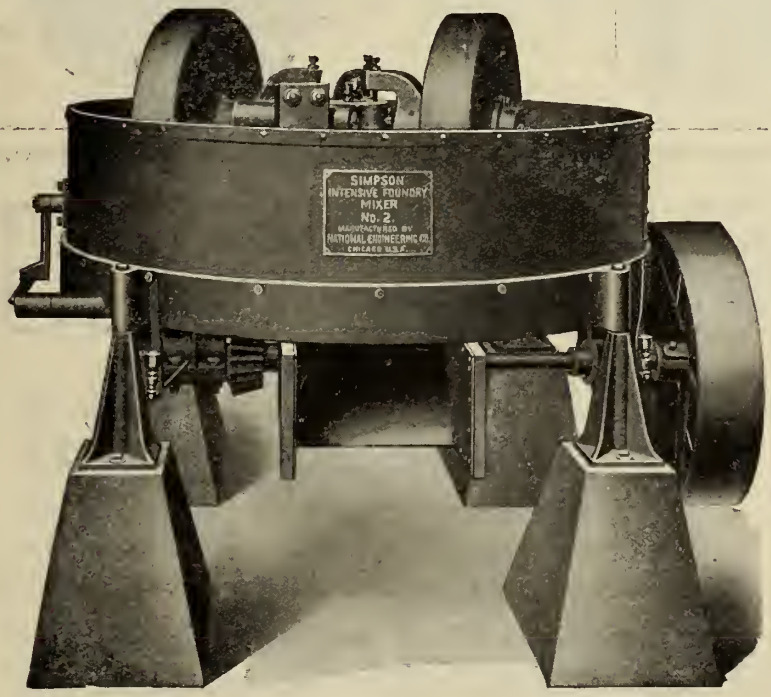
INTENSIVE FOUNDRY MIXER

These Firms Maintain—

what we have always said that the Simpson is *economical and efficient for all kinds of sand mixtures in foundries producing steel, gray iron, malleable, brass and aluminum castings.*

The spirit of the letters shown here is typical of existing conditions in hundreds of foundries throughout Canada and the United States. Without a single exception the adoption of a Simpson Mixer means better mixtures and better castings with minimum labor and upkeep expense.

Send for pamphlet No. 50 and list of many users.



Ottawa, Ont. Can., Oct. 28, 1920
"Using Simpson Mixer to mix core sand in our brass foundry —getting good results."
Ontario Specialties Co.

Chicago, Ill., Sept. 27, 1920.
"We are using four of your No. 2 Simpson Mixers at our Deering Works, for core sand and facing sand. Have effected attractive saving, and secured excellent results."
International Harvester Co.,
(Deering Works.)

Chicago, Ill., Jan. 10, 1921.
"Regarding your Simpson Mixer which we have in our foundry we are using this machine with very good results for facing, also for core sand, using both oil and pitch binders. Aside from the saving in binders and new sand, which offsets the cost for power to run the machine, we save about $8.00 a day in labor besides. We have no complaints whatever to make and regret that we did not have the machine years ago."
Semi-Steel Test Foundry Co.

Simpson Mixer used in nearly one thousand foundries

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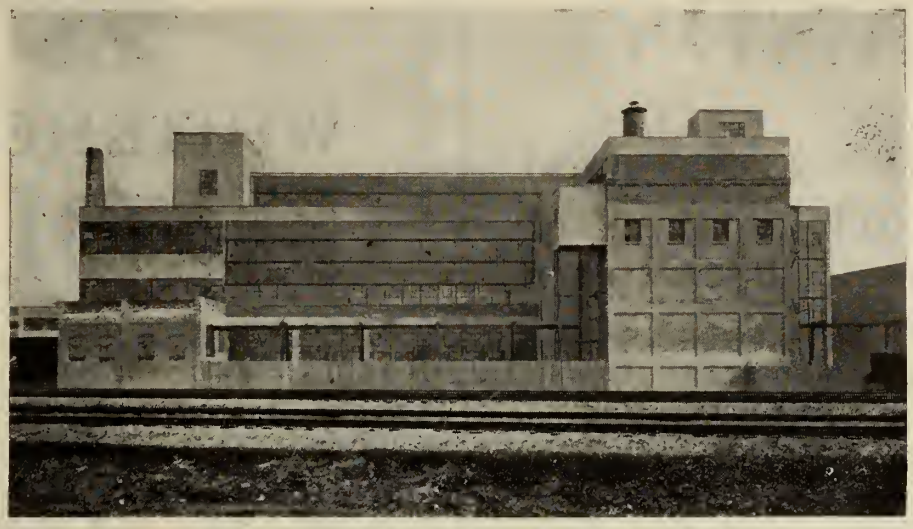

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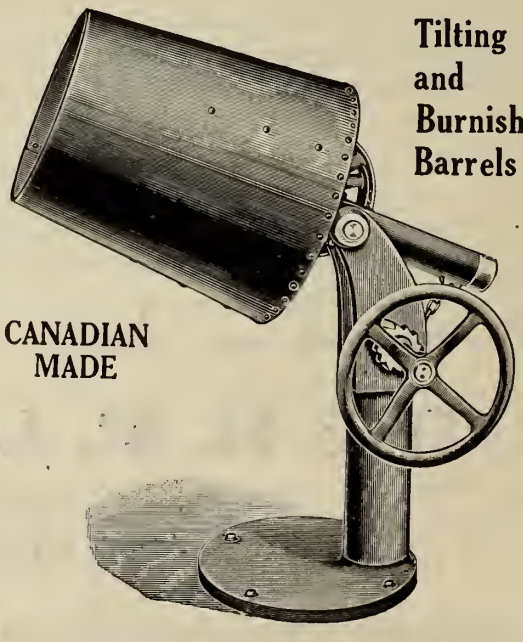

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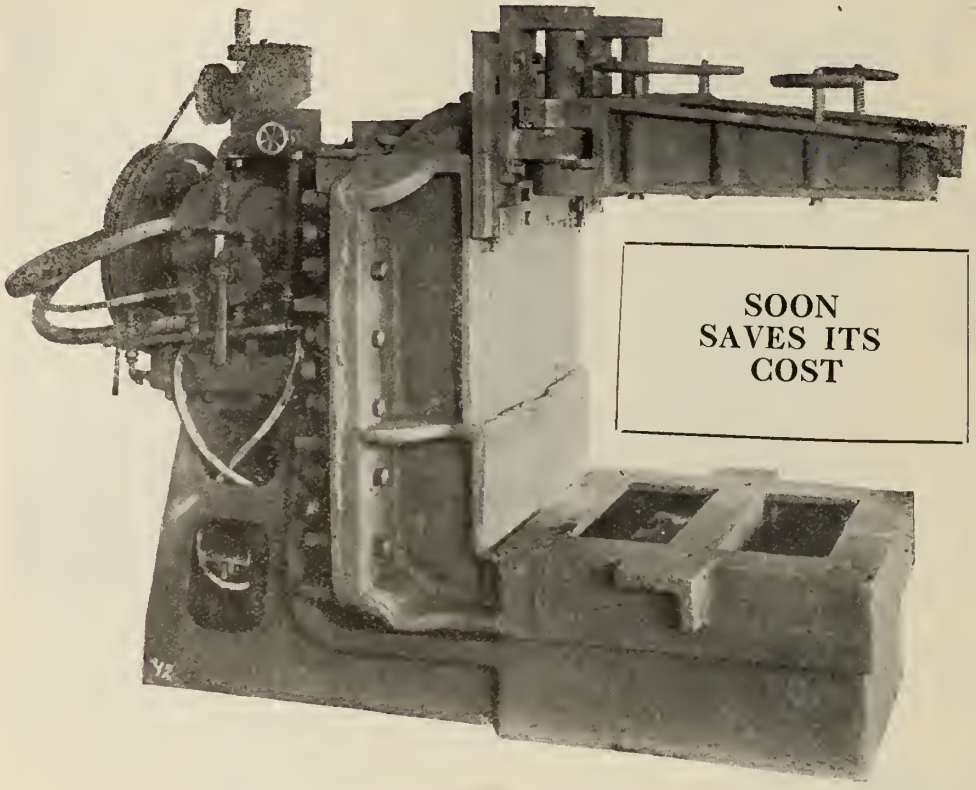

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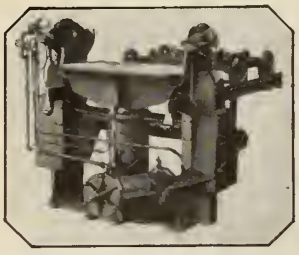

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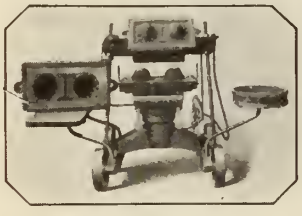

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3. Uniformity of castings.
4. Five to 10% saving in metal.
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CANADIAN FOUNDRYMAN
AND
METAL INDUSTRY NEWS

Member of the "Audit Bureau of Circulations"

Established 1909
Published Monthly

A Unique Foundry for Production of Car Wheels

Molds are Placed on Moving Platform Which is Semi-Automatic and Taken to Place of Pouring—Shaking Out and Annealing With Very Little Effort on the Part of the Workmen

BY OUR STAFF CORRESPONDENT

DURING the last few months there have appeared in the columns of this publication numerous articles on the manufacture of staple hardware and other lines of metal products, together with illustrations of the plants and equipment for producing same, showing that Canada is well to the fore in most lines of foundry work, but there is one line which has not yet been shown and this fact may be taken as evidence that our Canadian foundries have not been keeping right up-to-date in this particular line. I am referring to the chilled car wheel which is used in such enormous quantities on our railroads.

There are very few countries in the world with the amount of rail-road mileage which is to be found in Canada.

The Canadian National Railway system which includes the Grand Trunk is the longest railway in the world under one management, having 22,375 miles.

The Canadian Pacific which stretches from the Atlantic to the Pacific and with a network of branches is another of the world's greatest railways.

Needless to say, the number of car wheels required is enormous. Canada is well supplied with car wheel foundries and all the wheels used on these enormous systems are made in Canada, and are second to none in quality, yet, to the best of my knowledge and belief every car wheel which is made in Canada is made by hand and by the same process which has been in vogue, ever since chilled car wheels were invented.

Despised by the Molders

If there is any one thing more than another in connection with foundry work which causes a molder to shudder it is the mention of making car wheels. No molder wants to work on car wheels if he can escape it for the reason that it is hard work, heavy work and hot work. But the molding and founding of car wheels in Canada is due for a change in the near future. Labor saving machinery will solve the problem and not only make life more pleasant for the workmen but increase the output and reduce the cost of production.

The use of labor saving machinery has been the cause of very marked reductions in the cost of manufacturing various kinds of products. This has been esepcially true with such foundries as have adopted labor saving methods and equipment which have been developed and perfected in recent years.

The molding machine has been one of the most noteworthy contributions to the foundry but in many cases their use has accomplished only a small proportion of the possible savings.

This condition is due largely to the great bulk of castings to be handled and the large amount of sand required in making the molds, necessitating so much labor that the savings derived from the use of the molding machines are partly lost.

Foundries producing cast iron car wheels have been particularly handicapped by this condition, and mainly for this reason, molding machines have been little adopted by them.

Buffalo Concern Makes Forward Move

At the present time, however, the need of cutting costs is urgent and the present depression is an admirable period for solving such problems. The Brown Car Wheel Works, Inc., an old established plant in Buffalo, New York, has taken advantage of these facts and has overcome many of these difficulties by a readjustment of their entire process and the in-

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Fig. 1.—Brown Car-wheel Foundry as it appeared before alterations were made.

stallation of a rather unique system of handling equipment.

This plant had never made use of molding machines, the molding all having been done by hand and, as is usual in this type of foundry, the molds when completed were placed over the entire floor area of the foundry, the molten iron being taken to the molds, wherever located, the pouring taking place between the hours of one and five in the afternoon. Fig. 1 is a view before any changes were made, showing this arrangement.

It was evident that to obtain the total possible savings, the whole process of making car wheels should be analyzed in such a way that it could be divided into the essential elements. This was found to be as follows:—

1. The delivery of molding sand to the molding floors.
2. The making of the molds.
3. The removal of the molds from the molding floors.
4. The pouring of the castings.
5. Allowance of time for the castings to partially cool.
6. The removal of the partially cooled castings from the molds.
7. The removal of sand from the flasks and castings.
8. The placing of the castings in the soaking pits.
9. The removal of any foreign material from the sand.
11. The transportation of the sand to a storage bin.

It was apparent that if appreciable economies were to be obtained, these various functions should be performed mechanically and as far as possible by automatic equipment. The installation of molding machines would eliminate much of the labor involved in making the molds; the transportation of the molds could be accomplished by a mechanically operated conveyor, and sand handling equipment would provide the means for moving and tempering the sand.

There has been some opposition from foundrymen in the past to the use of conveyors handling completed molds as large as car wheel molds since there was a tendency to jar the molds excessively and as the conveyors were usually in continuous motion, it was difficult to pour the large amonut of iron required to close the two halves of the mold on the conveyor and it was necessary to do this before placing them on it.

Moving Platform

These objections were overcome by a moving platform of unique design, and having an intermittent motion which can be regulated to suit any required condition. Fig. 2 shows the platform which is composed of a number of cars, each of suitable size for carrying a mold and running on a track layout of rectangular shape. The design of the platform is such that each car upon arriving at a corner, without the platform turning, automatically starts in a direction at right angles to its previous direction.

The four sides of the platform are operated independently and each as a unit by pneumatic equipment controlled from the Station "F", elevated to give the control operator an unobstructed view of the foundry.

A further reference to Fig. 2 will show that two opposite sides of the platform have one less car each than is required to completely fill them and the control governing the motion of the platform is so designed that upon movement of the control lever by the operator, one of these sides is advanced an amount equal to one car, the vacant space making this possible.

Fig. 3—Showing molding machine and sand chute.

A further movement of the control handle operates the line on the opposite side an equal distance, these two movements having thus left vacant spaces at the ends of the two remaining lines which are then successively advanced the length of one car.

The action of the control is semi-automatic, and is so designed that the four sides of the platform can not be advanced other than in the proper sequence. Provision is made for stopping any side of the platform instantly in case this is necessary. The movement of the cars starts very slowly, attains maximum speed and is very gradually retarded, and so timed that the platform is stationary while the mold is being closed and during the pouring.

There is little danger of sand and dirt getting on the tracks as it is placed well above the level of the foundry floor, and the sides of the car, accurately machined, are in close contact and overhang the track.

The molding machines of the jar ram roll over type are provided and located on either sides of the platform. The machine "B", Fig. 2, is used for making the drags, and is placed at a sufficient distance from the platform "P" to allow for the installation of a small section of gravity conveyor "C" upon which the drags are deposited, face side up after ramming and having the pattern drawn.

The truck "D" delivers the cores directly from the core room and they are placed in the drag while it is resting on the gravity conveyor. The drag is then slid on to a car, on the platform, directly in line with the conveyor.

In the meantime, a cope has been completed on the machine "A" which is located sufficiently far from the platform to permit of the cope being finished while another is being made. After finishing, the cope is closed over the drag resting on the platform. The platform is now advanced an amount equal to the space of a car, thus bringing an empty one into line ready to receive another mold.

Fig. 3 is a view taken across the two molding machines and showing their re-

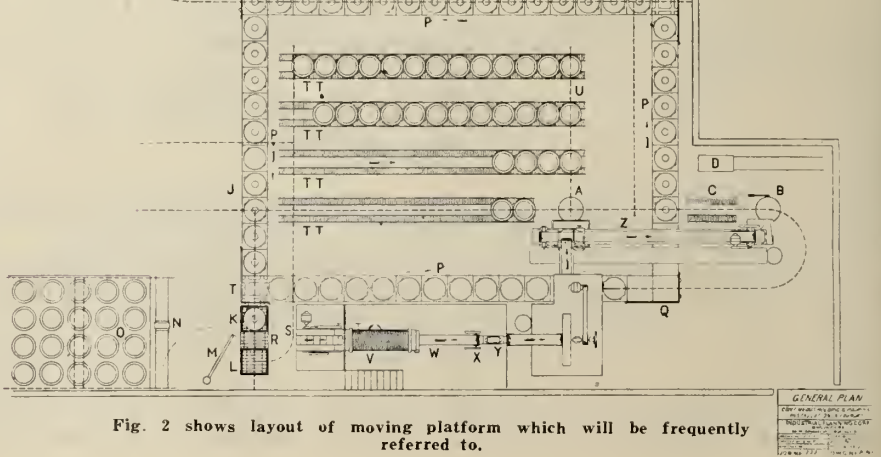


Fig. 2 shows layout of moving platform which will be frequently referred to.

lation to the moving platform. The sand is delivered to the mold through the sand chute shown over the molding machine and will be described more fully later.

The trolley carrying the air hoist on which the copes are handled can be clearly seen passing over the center of the molding machine, and track extending across the moving platform. The hoist carries a bale which engages the lugs on the mold, making it easy to turn when suspended from the hoist.

Referring again to Fig. 2, the platform carrying the molds is advanced in the direction indicated by the arrows to the position "G" where the pouring is done. "H" represents the receiving ladle at the cupola and from this the iron is poured into distributing ladles which are carried on the track "I" which passes directly over the center of the platform. The pouring for the entire foundry is done by two men stationed on either side of the platform, the molds being poured in the center.

Fig. 4 is a view of the pouring section taken when the foundry was not in operation, and it will be noted that the platform is carrying empty flasks instead of completed molds. The control station on the elevated platform is clearly shown in the center, also the trolley on which the iron is carried over the platform. It should be noted that the length of platform between the molding position and the pouring section is ample to provide for storage of molds ready for pouring, and also that there is sufficient space in the pouring section to provide for any fluctuation in pouring.

The time required for the platform to advance from the pouring section "G" Fig. 2 to section marked "J" is allowed for preliminary cooling of the castings after which the flasks are unclamped preparatory to shaking out.

"K" and "L" are two shake out machines set directly in line with one side of the platform.

The entire mold with the casting is picked up at "J" by an air hoist suspended from a trolley running on a track suspended over the center of the platform, and is deposited on the shake out machine "K". The cope carrying the casting is next lifted off and deposited on the shake out machine "L" where the sand is shaken through the grating shown. The casting is now lifted off by jib crane "M" and deposited on the transfer car "N" from which it is placed in the soaking pits "O" by means of a traveling crane. The drag flask, after shaking out the sand, is deposited by the

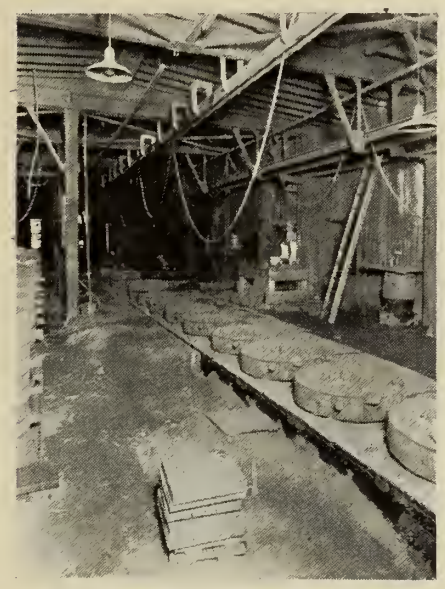


Fig. 4.—This view is of the pouring section but was taken before the improvements were put into commision; the flasks being empty.

air hoist on a car which has moved into position "T". The cope is carried by another hoist on a trolley running on the track "S", and deposited on the end of one of the four lines of gravity and conveyors "TT".

Copes With Chills Must be Allowed to Cool

The chillers for chilling the treads of the wheels are bolted to the cope flask and as it is desirable for these to cool thoroughly before using, a day's supply is provided and is stored on these four lines of gravity conveyors which are pitched towards "U".

Fig. 5 is a view taken from the same position as was Fig. 1 and shows plainly the extra cope flasks standing on the lines of gravity conveyors. Fig. 6 shows the relation of the shake out machines to the moving platform. The sand, after being shaken out, falls through the grating on to a pan conveyor which deposits it in a rotating screen where the sand is riddled and deposited onto a belt "W" Fig. 2. This belt passes over a magnetic pulley "X" which removes all particles of iron. From this belt the sand is deposited in the elevator "Y" where it is taken to the top of the building. Here the sand is automatically cut and tempered and then deposited in a storage bin where it is allowed to stand for at least a day before using. From this bin, the sand is distributed by belt conveyors to small storage tanks located over each molding machine. A chute connected with each one of these tanks allows the sand to fall into the flask by gravity.

The cope flasks are taken off the bottom end of the gravity conveyor "TT" by an air hoist and trolley running on the track "U" as needed for the cope machine "A". The drag flasks are taken off the platform at "Q" by a trolley as indicated by the dotted line to "B".

The results of the installation indicate that it has been possible to get very much greater benefits from the molding machines than could ordinarily be expected. It has been necessary to change over the methods of operation that had been in use. Molding is now started at seven in the morning, pouring beginning

Fig. 5 shows extra cope flasks with chills. These can only be used once per day, while the drags are used continuously.

Fig. 6 shows relation of shake out machine to moving platform.

at about eight, and continuing until four in the afternoon. This makes a continuous flow of wheels from the plant throughout the day.

It thus becomes possible to keep the wheels at a uniform temperature as they go into the soaking pit, which ensures a more uniform anneal in the soaking pits.

It is not necessary to have night gang employed in the foundry, and this is not only an appreciable saving, but removes what is usually a source of trouble.

The same production is now obtained as formerly and in about one half of the floor space previously used. The labor cost has been very greatly reduced and the quality of the castings much improved. As is usual where molding machines are used, the castings have a greater uniformity in weight.

There has also been many minor savings which in the aggregate are quite noticeable, such as shovels, riddles, sand and various kinds of molders' supplies.

It is apparent that the installation can be easily adapted to the manufacture of practically any type of castings produced in quantity.

The shake-out and molding machines were furnished by the Herman Pneumatic Machine Company of Pittsburgh, the sand handling equipment was furnished by C. O. Bartlett & Snow Company of Cleveland. The trolley installation, known as the S-T System, is manufactured by the Whiting Corporation of Harvey, Illinois, and the air hoists were furnished by the Curtiss Pneumatic Machinery Company, St. Louis. The gravity conveyors were supplied by the Mathews Gravity Carrier Company of Ellwood City, Penna.

The general layout and special features were designed by the Buffalo Office of the Industrial Planning Corporation, Ltd., Engineers, 60-62 Front Street West, Toronto, Ontario.

Operating the Cupola in the Iron Foundry—II.

How to Proceed After Putting Up the Doors— Slagging Strongly Recommended — Various Fluxing Agents

CONSIDERABLE divergence of opinion obtains among foundrymen as to the best method of charging a cupola to insure the most satisfactory results. No absolutely hard and fast rule can be laid down in this respect because few cupolas operate under exactly similar conditions and every single factor must be taken into consideration when figuring a problem of this character. However, many of these factors may be regarded as standard and with slight modifications may be applied to any size or type of cupola.

Taking a 42-inch diameter cupola inside the lining, the following may be regarded as fairly representative of the sequence of operations. It will be noted that an extra heavy charge of iron is placed on the coke bed. While this practice is not looked upon with favor by some foundrymen it is nevertheless warmly defended by those who have tried it.

Putting up the Doors

The drop doors are raised and securely propped; care being taken to see that they fit closely into place and also to see that the prop holding the doors in place is approximately perpendicular and driven up tiglet. If this last precaution is not observed the doors are apt to work loose while the sand bottom is being rammed in place; a circumstance which later will result in a "run-out" at some time during the progress of the heat. The sand bottom is prepared as outlined in the preceding bulletin of this series. No. 10, after the oily waste, or shavings and kindling wood are added. The wood should be dry and a sufficient quantity used to thoroughly and evenly ignite the coke. The proper amount of coke to use on the bed will vary between 800 and 1,200 pounds, depending on the height of the tuyeres above the sand bottom. Approximately 10 per cent. should be held in reserve and added just prior to charging the iron.

The first charge will consist of 2,500 pounds of pig iron and scrap made up in the usual proportions customary in the shop. The large pieces should be placed around the edge and the smaller pieces in the center. They should be placed close and level to hold the heat and also to insure that each succeeding charge comes down evenly and at maximum speed for the size of the cupola.

Charging the Cupola

The charges, after the first, should be uniform in weight and consist approximately of 100 pounds of coke; 500 pounds of pig iron; 500 pounds of scrap and 50 pounds of limestone or other flux, placed in the cupola in the order indicated. If steel scrap forms part of the mixture it should take precedence and be placed directly on the coke.

Given a sufficient quantity of coke a cupola will melt any piece of iron that can be charged into it; but for even and uniform melting the pig iron should be broken into reasonably short pieces; and the same rule holds good for scrap. Reduce the last 2 or 3 charges of coke 15 to 25 pounds and if hard coal is available 3 or 4 shovels around the edge will insure a clean drop. Instead of reducing the coke on the last charges some melters prefer to increase the weight of iron charges. Either method is satisfactory and reduces the coke consumption.

When the last two charges reach the melting zone; the upper tuyeres, if in use, should be closed and the blast slackened off by partially closing the gate in the main wind pipe if a fan is used; or by opening the peep holes in the wind box if a positive pressure blower is employed and there is no provision made for throttling it down. A high pressure and volume of air delivered into the cupola near the close of the heat has a tendency to freeze the slag near the tuyeres and promote bridging.

Slagging is Necessary

While it is true that a cupola can be operated for two or three hours without slagging, it will be at the cost of efficiency and always means a difficult and long job on the following day in preparing the cupola for the day's heat. As a general rule it may be stated that any cupola which runs for over an hour should be slagged. Where the charges consist mainly of dirty sand-covered iron; or where the scrap is oxidized or burnt, a fluxing material should be used generously even for short heats.

Fluxing Agents

Various fluxing agents including fluor spar, calcium fluoride, fluxing stone, dolomite, magnesia, limestone etc., are employed for this purpose. Some deposits of limestone are superior to others for fluxing purposes. They will average about 55 per cent. lime. Limestone is usually shipped direct from the quarries in car load lots.

The amount of each of these various agents to be used will depend on the weight of iron charge, the diameter of the cupola and the character of the coke. A typical charge in which limestone is employed as the fluxing agent follows: If the coke bed is 2,000 pounds, put over it 15 per cent., or 300 pounds of limestone; then follow with pig and scrap. The next charge is, say, 500 pounds of coke; put 75 pounds of limestone over it and follow with pig and scrap, being careful to spread all charges evenly and so on with succeeding charges. The large Bessemer converters often use as much as 20 per cent. Too much limestone will produce a stiff slag.

The danger of a lime cinder cutting the brick lining is over estimated as a general rule by cupola men. The cost of the limestone is saved by less waste of iron. The advantages of using a slagging agent are: It absorbs sulphur from the coke; prevents a waste of iron; makes a good cover for the molten iron, preventing oxidation; and it ensures a clean cupola.

Fluor spar (fluoride of calcium) originates in the states of Illinois and Kentucky and large quantities are imported from the Manchester district of England. It analyzes about 80 per cent. to 90 per cent. fluoride of calcium and is shipped in lumps, gravel or powdered form. The fluoridine in the fluor spar combines with the silica and forms fluoride of silicon (a volatile compound) which goes out of the stack when used in melting furnaces. About 15 to 25 pounds to each ton of iron in the cupola or it may be placed in the bottom of the ladle. It makes a fluid slag which can be skimmed from the top of the ladle leaving the clean metal to pour.

Blending Molding Sand by the Muller Process

Demonstrating the Advantages of This Type of Machine for Work for Which It Is Intended, such as Mixing Facing and Core Sand

By F. H. BELL

IN THE early part of the present year I endeavored to describe a few of the important features in connection with molding sand and in doing so I just described the qualities most desired for different kinds of work, but I did not go very deep into how sand with these qualifications could be the most economically and satisfactorily secured. In testing a batch of new molding sand it is not a difficult proposition to ascertain if it is suitable for the work to be done, but in case it is not suitable and there is nothing handy which is just right it is a mighty nice thing to be able to blend this unsuitable sand with something else which will bring it to the proper consistency.

As I pointed out in my former articles there are two main ingredients which make up the soil which covers the face of our planet, viz sand and clay—technically known as silica and alumina. These two ingredients may be found pure in the form of pure silica or pure kaolin, but more often they are found mixed together in the form of loam. Clay may be excessive in the loam in which case it would be known as clay loam. If the sand is in excessive quantity it will be a sandy loam. A sandy loam is what we require for molding sand, but it is possible to have it too sandy, in which case it can be improved by additional clay, and vice versa. Some sand pits will be rich on the surface and weaker below, while other sand is all right with the exception of lumps through it which are too high in alumina. All of these difficulties can be overcome if proper facilities are used to blend them.

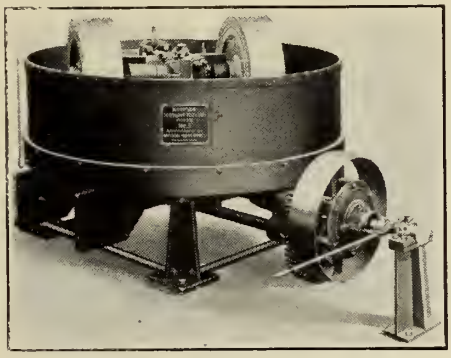
In addition to preparing new sand there is the old sand to be reckoned with. A riddle full of new sand shoveled through the sand from the heap does not improve it particularly. Clay wash thrown on old sand would build it up to some extent if it could be properly mixed and blended, but it just makes a sheet of clay on the surface of the sand when done in the ordinary way, and mixing with a shovel simply breaks it up but does not cause it to let go of the sand to which it is adhering.

These are all difficulties which are well known to foundrymen, but have been considered part of the game and passed over as such.

The time has come when nothing can be passed over if a remedy is at hand.

The Muller Type of Mixer

A simple machine known as the muller type of sand mixer would seem to cover the ground successfully. The illustrations will show in a fair way, the principal on which it is worked. Watch a core maker mixing a small batch of sand for some particularly exacting job and a good idea of how the muller works will be formed. He takes a small quantity of sand which has been mixed by the laborer and places it on the lunch. With his two hands, one on each side of the pile, he forms it up into a ridge like a molder's sand heap. He then takes a block of wood and begins at one end of the ridge and rubs it against the bench with the block of wood, each rub forcing some of the sand into a new pile. When all is rubbed he takes his hands and ridges it up again and repeats the operation. The oftener he repeats this



Sand blending mill or muller.

the better it is blended. If there are different brands of sand and different binders in the mixture they will become one homogeneous mass. A description of the muller will show that it works on the same principle.

As will be seen in the illustrations, it consists of a stationary circular pan, in the center of which is located a vertical shaft, to which is keyed a central supporting casting or cross head, the latter resting on a turret in which are the bearings for the central shaft, this shaft being operated by bevel gearing, which is located below the machine and out of the way of the sand or grit. The central supporting casting carries the plows and mullers. The function of the plows is to turn over and move the sand mixture alternately inwards and outwards, the outside plows moving the mass of sand inwards towards the center and the inside plows moving the sand outwards towards the pan rim, while the mullers revolve on their own axis around the center of the pan, the pathway of the mullers being at a point where the mixture is heaped up the highest by the movement of the plows. The action of the plows together with kneading and squeezing action of the mullers result in a thorough incorporation of all the elements of the mixture regardless of its composition.

These machines are invaluable for mixing facing sand and core sand. Ordinarily a cubic foot of sand weighs approximately one hundred pounds. The actual time of mixing depends upon conditions, but usually about two minutes or less is sufficient for core sand, while in mixing facing sand for either steel or gray iron, three or four minutes may be necessary, depending upon conditions of sand and the toughness desired. With an average sized machine with a capacity of say 5 or 6 cubic feet of sand it would be quite possible to mix from four to five tons of facing sand per hour, and double that amount of core sand.

There are different sizes of these machines on the market, some with much greater capacity than that just mentioned, and of course smaller ones for foundries not requiring machines of such large capacity. The muller type of machine is not in the same class as sand sifters or paddle mixers. These machines have duties to perform and are the right thing when in the right place, but the muller has a duty of its own.

In the next issue of Canadian Foundryman we will publish a paper read at the Boston convention on "Experiments to determine the most effective means of mixing and blending foundry facing sand." by R. F. Harrington. In the following issue we will publish a paper read at the Milwaukee convention entitled "Effective means of improving the quality of foundry sand mixtures," by Henry B. Hanley. These two papers while having been read by some of our readers, are both interesting and instructive.

SOLUTION OF THE RUST MYSTERY

A new theory explaining the rusting of iron has been advanced by J. Newton Friend of Birmingham, England, and delivered at the meeting of the American Electro-Chemical Society, held at New York, a short time ago.

What happens when iron rusts is a metallurgical mystery. Mr. Friend beleies that the corrosion starts "by the formation of colloidal ferrous hydroxide, which latter is alternately reduced by contact with iron and oxidized by contact with air, thus continuing the corrosion and the production of rust.

He also has found by experiment that although a piece of iron rusts badly when in water moving about half a mile an hour, when the velocity is 2½ miles an hour or more there is practically no rusting at all.

Molding and Founding Screw Propellers

Propeller and Ship Work in General will Always Be of Interest to Canadians

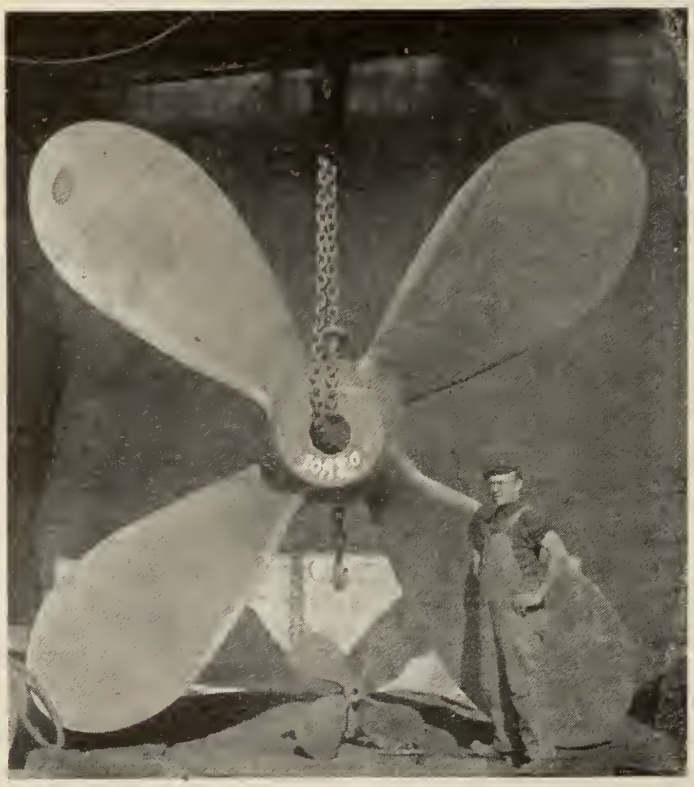
By F. H. BELL

IN the illustration will be seen representing what is known in nautical phraseology as a propeller, but formerly known as a screw wheel, in contra distinction to the side wheel which it succeeded.

The propeller as will be seen represents a nice piece of work for the molder on account of its twisted design, but the difficulty in molding will depend upon the equipment with which the molder is provided and also on the number of propellers of a given size and pitch which are likely to be required.

The propeller is one hundred per cent. a marine proposition, and as such might be considered by some as of not much account to Canadians. Canada may not be a leading nation from the ship-building stand point, but it is more so than is apt to be realized. My father was a molder and worked in a Canadian foundry eighty years ago, and steam boat engines constituted their only line. Of course screw propellers were unknown in those days but when they were invented by the Norwegian engineer, Ericson, they came into fashion in Canada at the same time that they did elsewhere and have been cast here ever since.

It must be remembered that outside of Great Britain and the United States, Canada has of late been the greatest ship building nation in the world. How long we can maintain this position is a matter of conjecture, but between Canada and the United States we have the greatest fresh water seas in the world as well as being bounded East and West by the waters of the Atlantic and Pacific, so it is a safe guess that we will always do ship building and build marine engines and incidentally make screw propellers. The foundryman will therefore be wise to keep himself posted on how the work is done and be prepared to do it.



Propellers, both large and small. A nice line of work for the pattern-maker as well as the molder.

There are various ways of molding this class of work, each having its good features. A complete pattern, and a flask to fit it would be a nice way to be fitted out, but this has two disadvantages. One is that it would require great precision on the part of the pattern maker to get all the blades exactly alike, and the other is that all the wheels would have the same pitch. It might be possible to alter the mold so as to make wheels of a slightly different size from the same pattern but they would all have the same lead. However if the demand for one pattern is sufficient to warrant it, this would be the most acceptable method, in which case there would be little to explain excepting to proceed with it the same as with any plain simple job. The principal thing to be considered would be the pattern making, and this will be described in later issues, not from my experience, but from those of expert pattern makers.

The system of molding from one blade attached to an upright spindle is the most common practice and has the most adantages when all things are considered. The pattern making for this will, of course, be a much smaller job, but will be the same line of work, and will also be explained. With this method the same rigging answers for a big variety of sizes and shapes.

There are instances where the prospective business would not warrant the expense of making the rigging, and in such cases, brick and loam are resorted to, and instead of a pattern, sweeps and strickles are used. In this class of work it is possible to make the entire mold in loam, but it is quite frequent that the bottom is made by this means and the top rammed up in sand. All of these different ways of molding the same kind of a piece are interesting and each foundryman will use his judgment in choosing which ever is most suited to his particular case. To describe all the different ways and means would take a number of letters, but should be well received. In the next issue we will describe the molding as done in dry sand from one blade, but with all the blades cast to the hub and making a complete four

bladed propeller. In the same issue we will show in another article the pattern making for the same job. In succeeding issues we will show the different other methods including the manganese bronze and other non-ferrous metals used in making propellers for salt water.

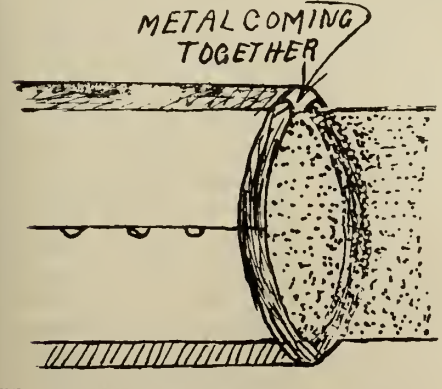
SOME FOUNDRY KINKS

By A. H. Obo

Why do pipes come defective on the top part when made horizontally and poured on the side? This is a question which is frequently asked, and the little sketch should show the answer. Picture the question, "How does the metal act when it is filling the mold?" It simply goes to the bottom first, and as more metal enters that which entered first is forced up the other side. If we stop pouring when half enough metal is poured to fill the mold we have half a pipe with both sides the same height, but if we continue pouring the iron rises on both sides of the core until it reaches a level with the top of the core, when the two thin surfaces of metal will naturally be sluggish by this time and will be, to some extent, oxidized, which will be shown by the metal being smooth and rounding. Any impurities which might be in the metal will naturally go to the top on the two sides. When the two oxidized, dusty and dull metals come together, they do not cut into each other and knit together as they should; they do not have sufficient fluidity to hold together against the slight kick which is apt to be caused by the core and incidentally the metal, which as we have said, is apt to contain all the impurities, does not make a sound casting at the place of meeting, even though the casting had been good otherwise.

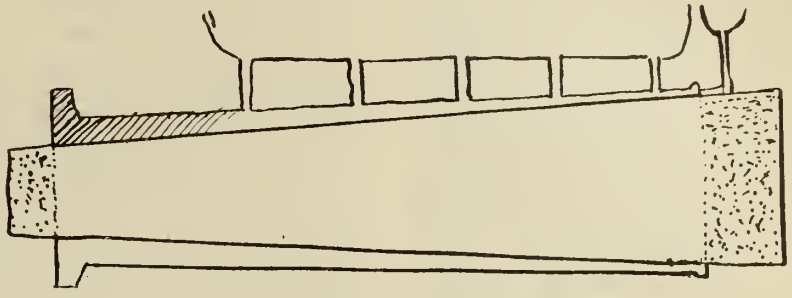
Had it been gated and poured from the two sides it would have been better for the reason that both sides would have been chopped up and kept from oxidizing until after the mold was filled above the joint; the two sides would both have been kept hot so that they would be in better shape to meet at the top, but otherwise there would be the same old trouble—the two metals will have to meet and adhere to each other, which is seldom done perfectly.

Pop gates, which in many classes of work are a nuisance, can frequently be used to advantage on pipes. They prevent any possibility of kick from the metal crawling over the core and they do away with any chance of a bad amalgamation of the metal at the top, but a pop gate is apt to cause splashing when the metal strikes the core and this will cut the mold. If a green sand core is used a pop gate is likely to cut the core.



Why pipes are frequently defective on upper side.

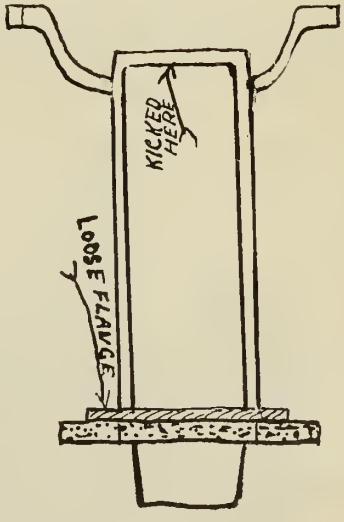
From this it will be seen that pop gates should be big enough to flood the portion where they strike so that the incoming metal runs in metal and not against the bare core. If this requires a pop gate which will be bigger than can be kept full, the casting is too bulky to be poured with a pop gate. I have been successful in a number of cases in pouring fairly large pipes by placing the gate right on top of the core print, and cutting it into the end of the core. In fact, I always pour building columns that way, as it makes better castings and is more easily done than any other way.



Two ways of gating cast smoke stacks.

I remember making some cast iron smoke stacks for road engines in a jobbing foundry. The shop where the engines were built was over-crowded with work and had to let some of it out. In the shop where they were manufactured, the rule was to put about a dozen pop gates about the size of a lead pencil along the top of the patterns. A big basin was built on top, big enough to hold all the metal required, and when pouring, the metal was just dumped into the basin and it could run into the mold at its leisure. This made a good casting and if it had been for a job which had to be machined, it would have made a clean one, but it represented a terrible lot of work, which is uncalled for on a smoke stack, and it left all the sears where the gates were knocked off. When the order came to the shop where I was, I placed the sprue on top of the print at the thin end and cut a wide, shallow gate into it, making sure that the thin edge would run and as the metal traveled along the casting got thicker and more easy to run. I made quite a number of them and had no trouble.

I have in mind another job which I worked on in a big shop and which baffled all the other fellows, but not me. It would have baffled me if I had followed the instructions which we were all expected to follow. I don't want to advocate insubordination, but I want to show the folly of trying to work as a journeyman moulder in the average foundry. Like so many foundries, it was dominated over by a superintendent who might have been a capable machinist, but he knew nothing about a foundry. The foreman was what would be called a filler in a big foundry. He could work with a gang or he could do good enough molding on trinkets, but he was not "up" on details. However, this job was handed to the men and they were supposed to make it, and as I have shown, it met with poor success until it got to me. I saw what was up and governed myself accordingly. It was the base for a three-way force pump and was shaped something like the sketch. I will not attempt to describe the pump, but just the molding of this piece. There was a lot of mechanism to go on top of this leg and one of the cylinders hung down into it. In addition to this, it was used as an air chamber and had to be perfectly air tight. It was made bottom up and the core was stood in a print which had to hold said core in place, while the metal was poured around it. The casting was a quarter of an inch thick, which was plenty for all it had to do, but the trick was to get a quarter of an inch of metal to lie on a flat-topped core of that size. All the vent had to go down the length of the core and then out through a hole in the bottom board. The core would be heat-



Pump stand which did not have sufficient metal over the core.

ing all the time the metal was coming up the sides, and a certain amount of gas would be gathering at the top and soaking out, and when the metal would flow over this spot it would make a slight kick which would not come back. The castings would look all right, but a tap with the hammer showed them up.

When the job was given to me I asked the machine shop men if it made any difference if I thickened up the bottom and he told me that any thickening would have to be done on the outside. This would not be allowed, so I would have to leave it as it was. I investigated the finished pumps and saw that there was plenty of room so I just decided that henceforth there would be plenty of metal to hold the gas back. The core print was tapered so as to allow the core to be driven down tight. I just sawed the end off where it was tapered and filed the taper up a little further and then drove the core to the bottom. The extra metal was a trifle and the castings were all sawed.

If the core box had been shortened anybody could have made good castings, but that extra metal would have been extravagance; but when they did not know it they never missed it. Where ignorance was bliss it would have been folly to be wise. The molding of this pump stand had some interesting features. The flange on which the upper work was to be bolted was loose on the pattern and in order to mold it in a two part flask we had a flat core with a round opening which fitted around the print of the centre core. When the sand was rammed up to the flange this flat core was put on and rubbed down to a bed. It was then taken away and the flange pattern drawn out and this part of the mold finished. The flat core was then replaced and the mold proceeded with as though no flange existed.

THE MOLDER AND HIS TRADE

IN SPITE of the draw backs which beset the molder's trade in a similar manner to that of all other callings, the trade of molding is one which can never die out. While I am a staunch advocate of progress and progressive methods which necessarily include the molding machine, I am also a staunch advocate of learning the trade.

The molding machine is a necessity and fills a long felt want, bringing work to the foundry which would otherwise be done by some other process. This is the sphere of the molding machine, and it is not to kill the molder as a mechanic.

Now For The Molder

The trade of molding was never better, from the working man's standpoint than it is to-day. To be sure, things are not any too brisk but they are no better in the molding machine department than they are in the hand work department, and for that matter there is no business any better at the present than is the foundry. But I do not want to dwell upon the condition of the times, but on molding as a trade.

An oft-heard expression is that in a few years their will be no molders and judging from the number of apprentices, or more properly speaking, the lack of apprentices who are seeking out the foundry, this would appear to be the coming fate of this most necessary occupation.

But wait and see. Every year will make it a better trade, and even though the prophecy of the pessimist becomes even partially verified it will have a beneficial effect on those who can hold a job in the jobbing foundry.

Other Callings

A short time ago there was a cartoon going the rounds of the magazines of college professors and other professional men trying to sell their education for a square meal of victuals. This, while only a joke, is more like the real trend of coming events. The colleges are flooded with applications from prospective students which can not be accepted. With public funds financing the colleges and laws being made to fortify the professions against opposition, there is a big temptation for the boy who would otherwise take to a trade, to go through for a profession, but it is being overdone.

The very fact that boys are not taking to the foundry is what is putting it in better shape for those who do take to it.

One lesson which is to be learned from the professional man is that he cannot practice his profession unless he has mastered it sufficiently to pass his examinations. This is not fully appreciated by the working class and many of them will plod along through life without putting forth much effort to improve their capabilities and thereby improve their chances of promotion.

Promotion does not always come as a reward of merit, but the capable man can always get himself a position commensurate with his ability and the employer who is not generous enough to pay according to merit will have to be satisfied with inferior help. However, the better workman can always hold the better job, and it behooves the man who intends to follow any trade to make it a point to be an expert in his line.

This page is for the benefit of the molder who is interested enough in his trade to read what others have experienced in the foundry.

If any of our readers have ever had any experience which they think would be of interest to others we will be glad to have them submit drawings and manuscript for publication.

To know how to make a mold is one thing, but to explain it on paper is another. Try a hand at it and see if your work does not become more interesting when you realize that others are learning from your experience. Canadian Foundryman is the only foundry paper published in Canada, and it is our aim to make it a real foundry paper, interesting alike to the employer and the employee. If you are interested in foundry work, we want you to be interested in Canadian Foundryman and to feel that it pages are your pages and that your opinion on foundry topics are on a par with those of the greatest foundrymen in the land. Don't knock the molding machine or any other improvement. Be up-to-date and show how modern improvements can be best utilized, but at the same time bear in mind that there are jobs in the foundry the same as in every business which will always be done by hand, and which call for the highest degree of skill, and the the man who can do these jobs is the man who will be in big demand.

THEORY AND ACCURACY

By A. S. TRONOMER

Two subjects which are frequently discussed in these columns are theory and accuracy—the one condemned and the other upheld, but strange as it may seem, it is necessary to reverse the regular practice in both in order to take the stand that is taken. Theory, we invariably condemn from every angle, while upholding accuracy. Practically everyone does a certain amount of theorising although it usually spells disaster in the foundry, but when it comes to accuracy, the average foundryman thinks "good enough" is all that is called for. Few foundrymen ever think that it is possible or in any way useful to have anything exactly right in the foundry. A more likely place than the foundry to use theory, would seem to be in astronomy, yet astronomy is carried on with a greater degree of accuracy than possibly any oher calling. Discovery of the planet Neptune is an example of what accuracy will accomplish, even though it would appear to involve an amount of theory.

When we read about the size of a planet and its distance from the sun we naturally associate it with a lot of guess work, but if molders would learn to be as accurate, and if foundrymen in general would have things so arranged that the molder could do his work right the foundry would have a much better reputation than it has.

Astronomy

A few words on astronomy will be interesting if nothing more. All heavenly bodies have an attraction for each other, and astronomers have this all calculated in advance to such a degree of accuracy that they can tell right to the fraction of a minute when an eclipse or other irregularity will take place. In the year 1846 the planet Uranus got off its course and did not appear in the proper place at the proper time. The astronomers knew that it had been influenced by some other planet, but they also knew it was a planet, as yet, unknown to them and they accordingly proceeded to figure out where it must be located. On the twentieth of September 1846 a French astronomer by the name of Leverrier had figured out exactly where this mysterious planet must be located in order to exert the influence

which was being noticed, but he had no lense powerful enough to discern anything new. He forthwith communicated his calculations to Dr. Galle of Berlin, who promptly looked upon the heavens with his powerful telescope, and on the very same evening discovered the planet within a single degree of its calculated position. This planet was afterwards named Neptune. Neptune is so remote from the sun that it takes 155 of our years to make one year up there.

Since 1846 is only 75 years ago, this planet has not yet made one half of a circle around the sun since it was discovered and put on the charts, yet the astronomers know exactly where it is and what speed it is making. This is what can properly be termed accuracy, although astronomy is usually looked upon as a theory.

I am going far afield from the foundry in order to show how it is possible to get down to fine points even in such a remote unlikely place as that of an undiscovered planet. If similar care is taken in the foundry it will become a much more successful and interesting business than it is. In future articles in this publication I want to show how molding and core making along with placing the cores in the mold can be done more successfully if brains are used to figure things out and a little more care is taken to have the mold and cores of exact shape and size. If a template is made to fit the prints on the pattern and then the core is fitted into this template it can not help but fix the mold.

While on the subject of astronomy I want to touch on the metallic meteors which fall from space and lodge themselves on the earth. These meteors are supposed to be pure iron but it is now becoming generally accepted that they contain other metals and metaloids which are found in the commercial iron of the earth, but the terrific heat to which they are subjected while passing through our atmosphere has changed the chemical analysis of the metals. Diamond is the purest of pure carbon and meteors are now proved to contain miniature diamonds which have been formed from the carbon contained in them. The other metals which melt at a lower temperature and which weigh less are melted and fall behind. Platinum and nickel which melt at a higher temperature and which are heavy remain with the iron.

Hand Propelled Sand Cutting Machine

In Which the Rotating Cutting Cylinder is Driven By Power, but Otherwise is a Hand Operated Machine for Cutting Over the Sand Head

A DOZEN years ago the superior molding qualities of machine tempered sand in the foundry had been thoroughly demonstrated, and a fair number of foundries were depending entirely upon sand cutting machines to cut and pile their floors.

Since then the introduction of the sand cutting machine has been rapid in comparison to the number of large foundries, especially where the volume of sand per floor is heavy.

Many of the smaller foundries, though recognizing the advantages of mechanically tempered sand, have considered the machine too large for their space, or the investment too great for the limited use they could make of it.

Without changing the cutting principle in the least. The American Foundry Equipment Company, 366 Madison Avenue, New York have lately developed a small, light type of sand cutting machine weighing less than 700 pounds, and employing power only for rotating the cutting cylinder. This machine is propelled and guided by hand like a push-cart by taking hold of the front frame member. While cutting, the cylinder blades have sufficient traction in the sand to force the machine along as well.

Certain stove shops and others whose floors are too narrow for the machines heretofore available will find the Type H machine a profitable substitute for shovel tempering. The over-all width is but 55 inches.

Length over all, 7 ft. 4 in.; Weight, approximately 680 pounds; Frame, Shelby Seamless Steel Tubing; Clearance above floor, 20 in.; Cutting Cylinder; Width, 36 in.; Motor, 2 H. P. (For cutting cylinder only.)

A glance at the construction shows how lightness is secured without sacrificing strength.

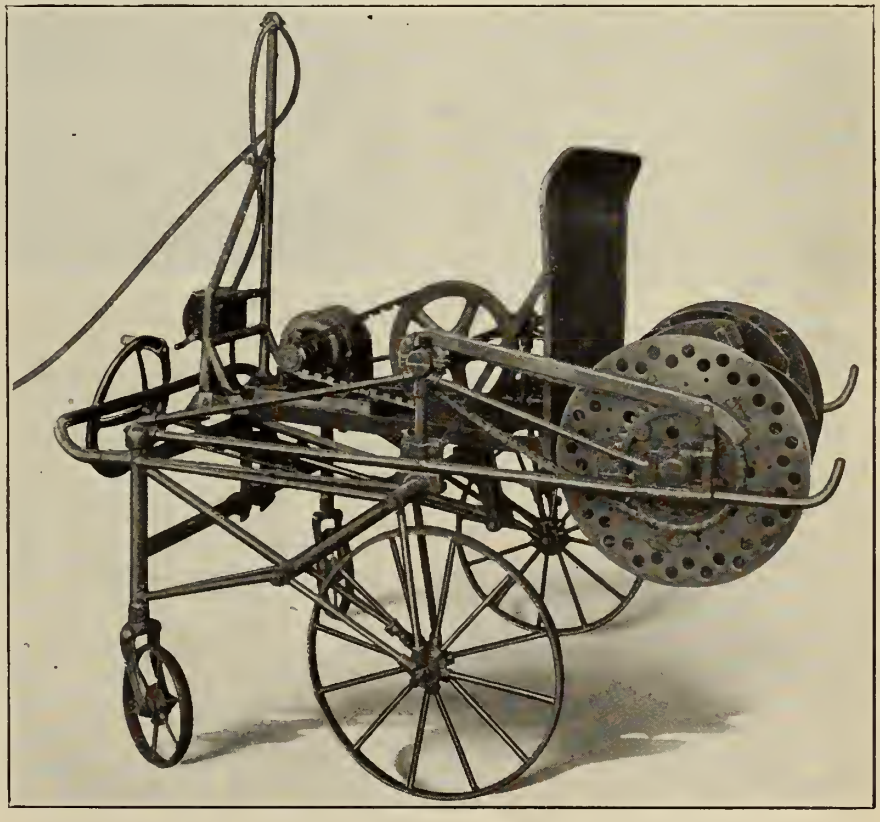
The front wheels being of caster type and mounted in inclined forks, the machine is said to steer easily without mechanism and can make very short turns.

The cutting cylinder with its shield, and the motor and transmission, are carried in approximate balance upon a tilting frame which has its fulcrum above and just forward of the the center of the rear wheels. By tilting this frame backward the steel cutting cylinder is lowered into the sand, and vice versa. This raising and lowering is done by a hand wheel at the front end of the machine acting through a bell crank and threaded connecting rod.

Power is brought to the motor by a flexible cable which plugs into receptacles located at convenient points in the foundry. The cable may be of any length necessary, and the motor of any desired voltage, alternating current or direct current.

With the introduction of this type of sand cutting machine the benefits of machine tempered sand are brought to the door of every foundry. These benefits have frequently been stated by the users of sand cutting machines about as follows:—

Quicker, cheaper cutting, saving of expensive drugery, full time for molding, sand uniform each day, wet and dry spots eliminated, finer finish, accurate weight, fewer blows, in other words MORE PRODUCTION, LESS DISCOUNT, BETTER BUSINESS.



Hand Propelled Sand Cutting Machine in which the cutters are revolved by power.

A Bronze Lantern Taken from Boscoreale

A Lantern Which Burned Oil and Had a Transparent Chimney—Not Exactly Modern in Design but Interesting

By F. H. BELL

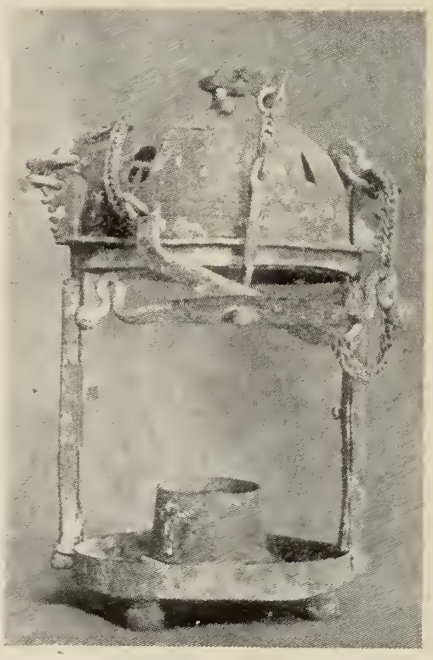
THE CHAINS on this lantern look so familiar that it is difficult to believe that it is nearly two thousand years old, but there is no getting away from the fact that it was in existence before the eruption of Mount Vesuvius in the year 79 A. D. It is not long since tallow candles were in common use in our own country, yet we find that the Romans were using oil lamps with wicks and chimneys.

Among the finds in the room of the olive-press in the Villa shown in a former issue were two lanterns, differing in size but not in form, one of these was delivered to some European museum, but one of them is in the Field museum. It is in fairly good condition except that the cover is indented and cracked and the lamp is loose. It is thickly covered with a green oxidation. No trace of the transparent cylinder which acted the part of chimney, is to be seen but, one certainly existed. as every indication is shown in the design of the lantern.

At first sight I pronounced it a hanging lamp, but I am informed, and am prepared to believe that it was a hand lantern.

The lantern as it has been preserved consists of the frame which contains the lamp, the cover and the handle with the chains for suspension. These parts may be seen clearly in the view shown, which shows the chains hanging loosely over the side. One of these chains connects to the top of the dome shaped cover and one on each side. Of the two fancy bars which are shown, the three chains would appear to be attached to the one. but in reality the center chain is attached to the bar with the knobs on the ends by means of the center bolt which slips through the first cross bar and is refitted onto the other. The bar with the knobs is the handle, and when lifted the center bolt pulls through a few inches, when all the chains will be taut. The frame, as may be seen rests on three short round legs, and consists of a bottom and top, connected by upright side-pieces. The flat bottom has a rectangular hole in the center for the attachment of the dowel or rivet which held the lamp. About the outer edge there is an upright rim which includes the bottom and is soldered to it. A lower secondary rim is soldered to the bottom just inside the other, the space between them serving to hold the transparent cylinder, which we will consider as the chimney. To the inside of the uprights. thin strips are attached by means of rivets, a small space to receive the vertical edges of the cylinder being left between the two pieces. About half way up the sides of the frame are two small eyelets the purpose of which is uncertain. It has been suggested that one was intended to hold the extinguisher, the other a pick. The hollow underside of the top of the frame enclosed the upper edge of the cylinder or chimny. The material of which this consisted was probably horn; at least traces of this substance are said to have been found in a lantern which is in a Berlin museum and which came from another villa near Boscoreale, and also in a lantern from Pompeii. That bladders were used for the same purpose has been fairly well determined by some authorities.

The dome-like cover, which, when the lantern is closed, rests on the u



Bronze lantern which burned oil and used a wick in the first century

ring of the frame, is ornamented with bands of encircling grooves. In it are two pairs of vents, the members of which are placed opposite each other, one pair consisting of triangular holes, the other of two three-quarter circles each, the flat sides facing each other. In the top there is a ring and staple, by means of which the cover could be connected with the handle, while at either side there is also a ring and staple. The two flat cross bars which I have described are, by some, considered to both be a part of the handle. From the printed matter which is attached to the lantern in the museum the following is taken:— "The handle is formed of two separate flat bars. the upper bar having a loop, a conventionalized bird's neck, and a knob at each end, the lower turning downward at the ends, to which are attached by means of rings the above mentioned side-chains. Both bars play freely on a stem, which by means of a short chain and a hook could be connected with the ring in the top of the cover.

As ordinarily carried, the lantern was probably held by the upper bar only, owing to the free play of the bars on the stem the frame would remain steady even when the hand turned to and fro. When there was no wind the lantern could be hung with the lid raised, in which arrangement more light would be cast, and the smoke could escape more freely. In this case also the lantern would be suspended from the upper bar and would appear in distended form. When the lantern was held by means of both handles there was no play on the stem, the cover was down and might be hooked or unhooked indifferently.

The lamp is composed of a broad band tapering toward the top and ornamented in the lower part with shallow encircling grooves, and a basis, to which it is fastened, consisting of a heavy lead ring encased in bronze and covered across the top with a sheet of bronze which serves as bottom to the lamp, and is ornamented on the underside with four shallow concentric grooves. There was probably a cover which is now missing. Within the lamp is the wick-holder which tapers somewhat toward the top and has the form of a wide open ring or ferrule. Whether it originally belonged to this lamp is uncertain. At any rate it is not in its proper place, for it is stuck into a gummy substance which is probably the residuum of the oil.

At present the lamp is not fastened to the lantern-frame, nor are there any traces on it of means of attachment except two oblong abrasions on opposite sides of the upper part where apparently some sort of brace was soldered in order to hold it fast. In the frame however, there are no vestiges of other means of attachment than the hole in the bottom previously mentioned.

In the lanterns of Berlin and Pompeii, before cited, the dowel or rivets. I am told, held the lamp by means of a lunated attachment affixed to the under side of the latter. The bottom of the frame in the Berlin lantern appears to have been double the dowel passing through both, while the upturned edge formed the inner rim. In the lantern at the Field Museum the lamp was undoubtedly riveted to the bottom of the frame, but that lamp can hardly have been the lamp which the frame now contains.

The lantern is a fair sized affair and I am not any too sure yet that it was not intended to hang from the ceiling but if the experts say it was a lantern we will consider it as such. Its height to the top of the staple in the centre of the cover is nine inches, when the handle is held up the extreme height is sixteen inches. The width across the uprights is six inches.

As I have already said, the lantern is in fair condition, although I am convinced that the lamp of it and some other lantern have become mixed. One of the chains had a bad link which has a modern repair in the form of a piece of iron wing but this wire is not being posed as ancient.

FEDERALIZING THE BATH TUB

A good many of our neighbors to the south have begun to look askance on the development of bureaucracy at Washington and their worst fears appear about to be realized. The United States bureau of education has set down as an official rule that Saturday night scrubbing is not enough and that bathing must be indulged in, or endured at least twice a week.

How this announcement will affect members of the health school that teaches against too frequent bathing, remains to be seen.

Now that bathing is receiving the attention of the law makers and is likely to become federalized, it may be of interest to note that the first bath tub to be installed in the United States was in the home of one, Adam Thompson of Cincinnati and was used for the first time on December 20, 1842. It was a mahogany affair lined with sheet lead.

The public first learned of it when the Cincinnati newspapers told of its having been exhibited at a Christmas party. A controversy followed. Some papers termed it an undemocratic luxury, and medical authorities are said to have looked on it as a menace to health. In the following year the common council of Philadelphia failed by only two votes to pass an ordinance prohibiting bathing between November 1 and March 15.

In the same year the legislature of Virginia put a tax of thirty dollars a year on all bathtubs that might be installed in that state. Several cities made the water rates very high for persons who had bathtubs. Even in Boston in the year 1845 an ordinance was enacted, but never enforced, to prohibit persons from having bathtubs except on medical advice.

There is no telling how far the opponents of the bath tub might have carried their opposition had it not been for President Fillmore giving it respectability. In 1850, when on a stumping tour as vice-president, he visited the Thompson home in Cincinnati, used the tub and became so strong an advocate of "tubbing" that on his election to the Presidency he had a bath tub installed in the White House.

Thus we see that in the course of three score years and ten, the alloted span of man's earthly career, we pass from the one extreme to the other—that of endeavoring to prohibit the use of the bath tub and of endeavoring to enforce its use.

We also notice that these apparently drastic laws are enacted in the American Republic where "Liberty" is the biggest word in the language, and where everything is supposed to be the most modern.

Yet readers of Canadian Foundryman will remember a couple of months back, the picture of the bath tub which was taken from the ashes beside Mount Vesuvius where it was burned nearly two thousand years ago. Its design was practically the same as that of the most modern bath tub and it was made of brass and cast in a foundry.

Either the Americans are two thousand years behind the times or the Romans were two thousand years ahead, or will we say that times are the same now as they always were and always will be and that the Roman bath tub probably belonged to a wealthy citizen who could afford to override the "Vox Populi" not only there or here, but everywhere.

NOVEL METAL

A metal which, so far, has not become a very common commodity with most foundries, but which bids fair to be exceptionally popular when properly known, is monel metal. This material is known as a metal and is refined from a natural ore, but is in reality a combination of metals. It derived its name from Amhrose Monel, vice-president of the International Nickel Company, and chairman of the board of directors, whose death was announced in New York in the early part of the present year. Although the product of Canadian mines, it was introduced by the Oxford Refining Company of New Jersey in the year 1905 and has since been gaining in favor as it became better known and its producers became better acquainted with its characteristics and usefulness.

History.

In 1884, during the construction of the Canadian Pacific Railroad through the Province of Ontario, Canada, a deposit of copper ore was discovered at a point near Sudbury. This deposit was opened on a commercial scale, but as the mining progressed, it was found that what had been discovered was not a copper deposit, but one containing both copper and nickel. Methods of separation and refining were developed and from this chance discovery originated the great nickel industry of this continent. In about 1905 it was conceived that for certain purposes it was not necessary to separate the nickel and copper, but that an alloy could be produced direct from this ore without separation. This was soon proven to be both technically and commercially possible, and the experimental production of Monel Metal was begun. Investigation of the resulting metal showed that there had been produced an alloy differing in kind from any previously known. In appearance it resembled nickel. In its tensile properties, it was more nearly allied to the steels. As might be predicted from its composition, its resistance to corrosion was excellent. Based on these properties, it soon found a market in places where both non-corrodibility and strength were required. Further knowledge of its properties and improvements in the methods of manufacture led to wider use, and this use to further knowledge.

Technically, Monel Metal is an alloy of nickel and copper, containing about 67 per cent. nickel, 28 per cent. of copper, and 5 per cent. of other elements. This remaining 5 per cent. consists partly of iron from the original ore and partly of manganese, silicon, and carbon introduced in the process of refining. It contains no zinc or aluminum.

Monel Metal is non-corrodible, strong as steel, tough and ductile. It can be machined, forged, soldered and welded, both electrically and by the oxy-acetylene process. It takes and retains a perfect nickel finish. As a resistant to acids, it is superior to the usual metals sold for this purpose, not alone due to its non-corrodibility, but because it is an alloy having great strength, in addition to the characteristics of such metals monel metal is decidedly an individual alloy. It has permanently established itself throughout the engineering and industrial fields. Particularly is this true wherein there has been continued effort by engineers to procure a metal to meet their specifications as to high tensile strength without having to sacrifice any other equally important requirement, such as non-corrodibility, resistance to high temperatures, and ease of working monel metal combines all of these characteristics. In cast form its minimum tensile strength is 65,000 pounds per square inch, while in rolled form it tests as high as 100,000 pounds per square inch. Physical properties: melting point, 1,360°C. (2,480°F.); Specific gravity (cast), 8.87; weight per cu. in. (cast), 0.319 lb.; weight per cu. in. (rolled), 0.323 lb.; coefficient of expansion, (20°C.—100°C.), 0.00001375 per 1°C.; electrical resistivity, 256 ohms per mil foot. (Temp. coefficient) 0.0011 per 1°F.; electrical conductivity 4% (copper 100%); heat conductivity, 1-15 that of copper; shrinkage, 1-4 inch per foot; hardness cast material 20—23 (shore scleroscope); hardness hot rolled rods 27 (average shore scleroscope); hardness hot rolled rods 162 (average brinnell); modulus of elasticity, 22,000,000 —23,009,000.

INFLUENCE OF TEMPERATURE

Present-day industrial conditions involve many operations wherein alloys must retain their strength at high temperatures. Their strength is known under ordinary conditions and selection is quite readily made. Little is known, however, of such alloys at high temperatures. Copper and bronze alloys, all having low melting points, are incapable of meeting these requirements satisfactorily. Nickel steel and similar materials show too heavy a falling off in both their tensile and torsional strength to withstand such conditions to the fully. Monel Metal is superior to the majority in this respect, where its tensile and torsional strength at high temperatures is involved.

The ability of Monel Metal to meet

such conditions is evidenced by the accompanying tables, which give the results of a number of extended tests. Practically all of the metals in general use have been tested in comparison with Monel Metal at temperatures up to 1030 de. F. The results indicate that Monel Metal is superior to the majority in this respect, both where its tensile strength and torsional strength at high temperatures are concerned. This makes it particularly valuable for the trimming of valves used with superheated steam, for turbine blading and all purposes where strength at high temperatures is most essential. A further advantage is that Monel Metal, due to its high Nickel content, resists erosion to a much greater extent at these temperatures and accordingly makes a valve that will stay tight longer under severe conditions of service than when made of other materials more commonly used for this purpose. An unusual instance of this is its successful employment in the refining of petroleum, which involves both high temperatures and acid conditions.

Some idea of its ability in this respect may be had from a few typical comparisons. For example, at 70 deg. F., the tensile strength of 30 per cent rolled nickel steel is 94,493 lbs.; that of rolled Monel, 104,900 lbs.; at 1030 deg. F., nickel steel shows but 36,350 lbs.; Monel Metal, 47,200 lbs. Where torsional strength is concerned. 35 per cent nickel steel shows but 25,350 lbs. at 800 deg. F., while the torsional strength of Monel Metal at the same temperature is 40,610 lbs., other comparisons being even more favorable; viz., 3½ per cent. nickel-vanadium steel at 800 deg. F., 14,340 lbs.; open hearth machinery steel, 26,350 lbs.

MONEL METAL CASTINGS

Monel Metal possesses numerous advantages in this form in that as a casting it still retains its high tensile strength as well as its ductility to a greater extent than most other metals. The fact that it is non-corrodible, does not scale at the highest practical working temperatures, and is immune to the effects of hot gases, has led to the adoption of Monel Metal in cast form to meet a broad range of requirements.

Castings are manufactured from metal supplied in the form of shot ingots or blocks. These may be prepared for this purpose over oil or electrically fired furnaces. For the greater part, ordinary foundry practice may be adhered to, although slight variances in methods are necessary. Successful castings up to 25,000 lbs. in a single piece have been made, some of them from intricate patterns. The data accumulated in a number of years' foundry experience with Monel Metal are available upon request.

Some of the many uses to which Monel Metal castings have been put are as propellers for battleships, transmission supports for the high-tension line on the Panama Canal, pumps for handling alkaline or acid waters, turbine wheels for hydro-electric plants, impellers for centrifugal pumps, and many other similar uses, where the wheel comes in contact with a corrosive solution or must run at a very high speed. Probably one of its most extensive applications in cast form is the replacement of the bronze plugs formerly employed in the Burton Gasoline still. These bronze plugs had an effective life of but a few months, whereas the first Monel Metal plugs furnished to the Standard Oil Company over a year ago are still in service, and there have been since applied over 80,000 Monel Metal plugs for this purpose.

Monel Metal castings are also made for dyeing and bleaching machinery, for acid handling equipment, as well as for a wide variety of purposes where proof against corrosion together with the high tensile strength of steel is absolutely essential.

LIBERTY ENLIGHTENING THE WORLD

An interesting piece of metal work, although not a foundry proposition, is the copper statue which stands on Liberty Island in New York harbor. This colossal statue was presented to the people of the United States by the French nation in commemoration of the hundredth anniversary of their national independence. The United States calculate their independence from the fourth of July when they signed the declaration, but the rest of the world considers it from Feb. 14, 1784, when Congress ratified the treaty of peace which was signed in Paris on Sept. 3, 1783. The statue, which is in reality a lighthouse, is representative of the Goddess of Liberty with a diadem on the head, and with arm extending upward holding a torch. It was designed by, and constructed under the supervision of the artist Bartholdi and the height of the statue proper, from the base to the diadem is 116 feet; to the top of the torch is 151 feet. The height of the pedestal is 95 feet, and the total height of the whole work above the waters of the bay is 305 feet, 11 inches --the tallest statue in the world. The pedestal was built by popular subsciption throughout the United States, but the statue was the free gift of the French people. It was not completed in time to be an exact centennial gift but was shipped from France on the transport "Isere" early in the year 1885 and after placing it on its pedestal it was unveiled on Oct. 28th, 1886, amid imposing ceremonies by President Cleveland in the prsence of the artist Bartholdi and other notable guests.

The torch is lighted by electricity. The statue is constructed of beaten copper plates, reinforced on the inside by iron stay-bolts. The modeling is broad and massive, and, where necessary, exquisitely fine. There are parts of the drapery that have the delicacy of work on a statuette. This is enhanced by a wholly accidental effect—the way in which the metal is wrought by the hammer gives the whole surface of it a kind of mottle which breaks up the ight precisely as the light is broken up on silk. The huge robe has thus a perfect texture, and one forgets that its folds are in stubborn copper. This applies more especially to the drapery of the lower part of the figure, just where the dress sweeps the ground. Beyond rises the mantle, or outer covering, in great majestic folds, treated with a perfect eye for the handling of masses in drapery. Above this again there is more work of extreme delicacy and the sleeve of the right arm would be a thing for any sculptor in the world to be proud of, and it is almost as great a credit to the artisan who did the mechanical work upon it.

The statue weighs 450,000 pounds or 225 tons. The copper alone weighs 200,000 pounds. Forty persons can stand in the head, and the torch will hold twelve people. The number of steps in the statue, from the pedestal to the head is 154, and the ladder leading up through the extending right arm to the torch has 54 rounds.

While serving the purpose of a light, its real purpose was that of enlightenment, and the name it received at its unveiling was "Liberty Enlightening the World" but this has been abbreviated and it is usually referred to as the Statue of Liberty. Among the notable statues of the world there are perhaps none which have received more consideration than the Colossos of Rhodes, yet it was only 105 feet in height while the Statue of Liberty is 151 without the pedestal on which it stands. While the former had its legs spread apart so as to straddle over the harbor, the latter stands on an island in the harbor.

NIAGARA FALLS MOVING UP STREAM

If a person will go below the Niagara Falls and look up at the walls of rock which form the sides of the river it will be plainly seen that these walls have been cut away as though by a giant lathe. The marks of the tool are as plain as any iron lathe ever left on a piece of casting. The tool which left marks was the Niagara Falls itself. This may not have started at the outlet of the river but it was certainly, at one time, as far below the falls as Lewiston and Queenston which are about seven miles from the present location of the falls.

It is estimated by scientists that it has taken from thirty-five to seventy-five thousand years (very divergent figures to be sure) for waters of the falls to cut away the Coraline limestone and other varieties of stone, which form the walls and bring the falls to their present location.

It is estimated, also, that 15,000,000 cubic feet of water passes over the falls in a minute. This would equal a cubic mile per week.

Making Patterns for Gearing—Rudiments

The Principals on Which Gearing Works, Are Shown Before Going Into the Actual Pattern Making

SOME months back we published a series of articles on pattern-making and general principles of gearings. These articles while instructive, only covered sur gearing, which is but a part of the subject. Bevel gearing, spiral, worm, helical and herring-bone gears are of equal importance and represent a much higher degree of skill in laying out, pattern making and molding. It is the intention, now, to finish this course, but before proceeding with it we must bear in mind that there are numerous readers who are only students and who do not know the meaning of many of the expressions necessarily used in referring to the subject. There are also a surprising number of pattern makers who could be classed as first rate workmen from a mechanical standpoint, but who are not familiar with the requirements of the gear pattern which they are making, and who only follow the drawings which must be made by someone, more intelligent than themselves. Again there are others who are more remotely connected with the work, but who do not know exactly what is required.

For the benefit of all of these we consider it best that before beginning with the actual pattern making we give a few lessons on the general principles of gearing so that the reader will the more readily understand what he is reading, and will be in better shape to grasp what is required of the gear wheel

TANGENT CYLINDERS.

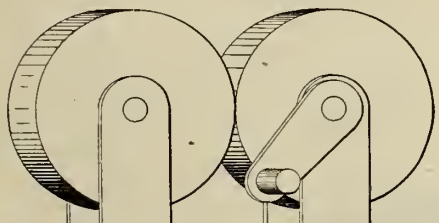


Fig. 1

which is to be cast from the pattern being made.

Pattern making is a calling which has many inducements for the educated class of boy, and any boy who is sufficiently intelligent to make a good pattern maker should be sufficiently interested in his work to be able to lay it out. We do not propose to enter the field of the mechanical draughtsman, as we can not cover so many subjects, but presuming that the student is versed in drawing he should be much helped by knowing what is required to be drawn. He should also know the expressions and names used in gearing practice. Beginning with our next issue, we will describe pitch, pitch circle, diametrical pitch, teeth, space etc., after which the real pattern making will be described. In the present article we will show the rudiments of gearing by the two tangent cylinders.

Let the two cylinders, Fig. 1, touch each other, their axis be parallel and the cylinders be on shafts turning freely. If, now, we turn one cylinder, the adhesion of its surface to the surface of the other cylinder will make that turn also. The surfaces touching each other, without slipping one upon the other, will evidently move through the same distance in a given time. This surface speed is called linear velocity. Linear velocity is the distance a point moves along a line in a unit of time.

The line described by a point in the circumference of either of these cylinders, as it rotates, may be called an arc. The length of the arc (which may be greater or less than the circumference of cylinder), described in a unit of time, is the velocity. The length, expressed in linear units, as inches, feet, etc., is the linear velocity. The length expressed in angular units, as degrees, is the angular velocity.

If now, instead of 1° we take 360°, or one turn, as the angular unit, and 1 minute as the time unit, the angular velocity will be expressed in turns or revolutions per minute.

If these two cylinders are of the same size, one will make the same number of turns in a minute that the other makes. If one cylinder is twice as large as the other, the smaller will make two turns while the larger makes one, but the linear velocity of the surface of each cylinder remains the same.

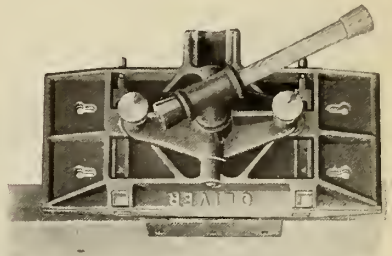
This combination would be very useful in mechanism if we could be sure that one cylinder would always turn the other without slipping. To overcome the slipping gearing does not depend on friction, but on teeth which mesh into each other. To lay out the teeth so as to retain the pitch circle is the main feature in gearing. This will be discribed in the next issue.

The Quigley Furnace Specialty Co. Inc., 26 Cortland Street, New York, announce that their pulverized fuel department has been acquired by The Hardings Company, 120 Broadway, New York. The Hardings Company state that there will be no change in the method of conducting the business at their offices, as the organization of the Quigley Engineering Department has been taken over practically intact.

The Quigley Co. have found it advisable to devote their entire attention to high temperature cement and insulation which they are greatly extending.

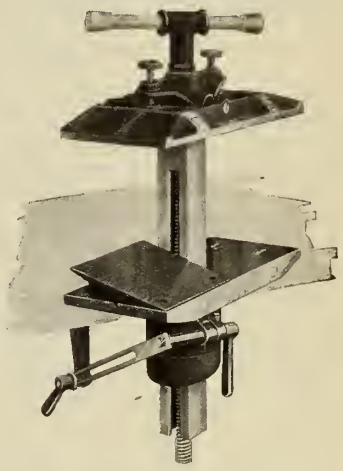
A NEW PATTERN-MAKERS' VISE

Oliver Machinery Co., Grand Rapids, Mich., have recently developed a universal pattern makers' vise which embodies many novel features not usually found in vises. The jaws are 7¼ inches wide, 18 inches long, and will open to 16 inches. The design and finish is perfect. Heavy ribs to the corners of the jaws, also to the center of clamping, strain point assure great rigidity and



Oliver No. 1 Universal Vise in natural position. Note rigidity of construction and unique design.

holding power the whole length of the jaw and not only in the center as on ordinary vises. The screw is steel 1 1-8 inches diameter with buttress thread, has self-centering and detachable nut, which can be easily removed for replacement. Note rigid construction of the trunion, which is part of the backjaw, illustrated in Fig. 5; also the clam lever used for clamping the jaws in any position in complete circle. The beam or bar is so



Vice with jaws horizontal and tilting jaw in place.

constructed that the metal filings, when working on metal patterns, will not fall into the screw and wear the threads; a decided advantage over other vises.

The first illustration shows the vise in its normal position with the jaws flush with the bench top, while the second illustrates the vise man upright position having the jaws horizontal, with the angle jaw in position. This angle jaw is detachable and used for small irregular shaped pieces. The locking bar, it will be noticed is flat and not round, which prevents slipping of the vise when set up in any position from 0 to 90 degrees.

The Industrial Crawling Tractor Crane

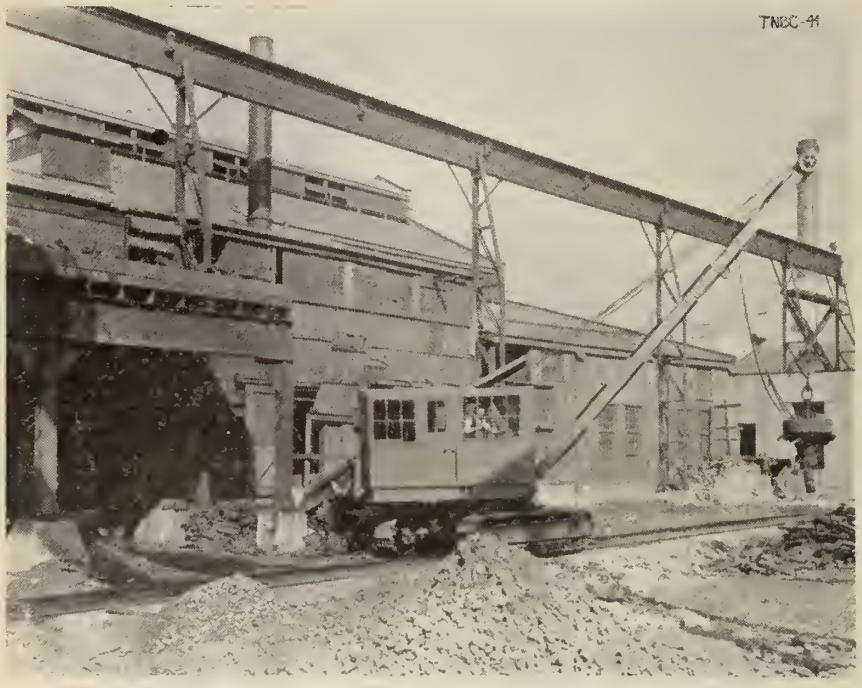
A Crane Which Crawls Without the Necessity Of Tracks, Making it Especially Useful in the Foundry Business

The crawling tractor crane illustrated in the accompanying views has been developed by the Industrial Works, Bay City, Michigan, to meet the need for a full-revolving tractor crane which can be operated independently of rails.

These cranes are adapted to the needs of road contractors, coal dealers, gravel, sand and stone producers, and moderate-sized manufacturing plants, their capacity and speed making them ideally suited for doing such jobs as moving coal, sand, gravel, etc., and for excavating duty, but it is their usefulness in connection with the foundry business which is of most interest. Within the limits of their capacity they will serve with the same efficiency as the railroad crane.

The maximum utilization of yard storage space is realized with the use of these cranes because their field of usefulness is not limited by railroad tracks as is the case with the railroad crane. They can be equipped to handle a hook and block, grab bucket, drag scraper bucket, wood grapple, electric lifting magnet, shovel dipper and pile driver leads with drop hammer.

Operation is by means of an internal combustion engine which has the advantages of being always ready for immediate use. When not in operation no fuel is consumed and it is not necessary, as is the case with steam operated machines to have a licensed engineer as operator. With a view to ease of operation in getting the most work out of the crane, study has been made of the requirements of the operator and everything arranged with a view to making the operation and maintenance of the crane as easy and convenient as possible.



Industrial crawling tractor crane handling pig-iron with magnet. Note unobstructive view which the operator has of the work.

Up to capacity of the motor any combination of crawling, hoisting the load and varying the radius may be made.

The crane is equipped with a thirty-foot boom made up of two channels strongly latticed with angles and tie plates.

The steering of the crane while propelling is accurately controlled by the operator from the position in the revolving upper works, by manipulation of the friction clutches and brakes controlling the motion of each tractor belt. By means of these clutches and brakes either tractor belt can be readily and instantly disconnected from the motor while the other belt continues travelling at the normal rate of speed.

The disconnected tractor belt can be held stationary by applying the brake, can be allowed to coast with the brake and clutch both disengaged, or the clutch can be allowed to slip, thus allowing the operator to turn as sharp or as wide a corner as he may select.

All the clutches, brakes and lever mechanism for steering is located in the revolving upper works where it is simpler and much more accessible than when a portion or all of this mechanism is located on the car body.

The propelling and steering mechanism is a new feature enabling the operator to propel and steer the crane independently of all other motions as easily as a wheel or caterpillar tractor.

The low cost of owning and operating a crane of this type affords the smaller industrial institutions an opportunity to handle bulky materials speedily, safely and economically.

Where conditions are favorable a crane of this type worked in conjunction with a magnet is an ideal arrangement for unloading pig iron direct from the car and depositing it on the cupola charging floor.

Crane can propel alongside of entire block of cars and unload them without waiting to have cars switched in order to unload.

Crawling tractor crane handling heavy flasks.

Some of The Economic Minerals of Canada

Some Figures of Production Taken from the "Preliminary Report on the Mineral Production of Canada During the Year 1920"

By WYATT MALCOLM

THE following figures of production are taken from the special edition prepared for the National Exposition of Chemical Industries, New York. They are correct but only present a few salient features of the mineral industry, and mineral resources of Canada. Mention is made of a number of the most important mining districts, but there are a great many districts having a very considerable output to which no reference is made by name.

It is not claimed that the information is even approximately complete. If the reader is interested in any particular mineral or mining district he should apply to the Deputy Minister, Department of Mines, Ottawa, Canada, for detailed information.

Mining is one of the most important industries of Canada. The value of the mineral production attained its highest point in 1920, amounting to $217,775,080.

The mineral production by provinces for 1920 was:

Nova Scotia	$30,187,533
New Brunswick	2,225,261
Quebec	27,722,502
Ontario	78,749,178
Manitoba	3,900,207
Saskatchewan	1,711,580
Alberta	33,721,898
British Columbia	38,044,915
Yukon	1,512,006

A great variety of minerals is produced; the most important are coal, nickel, gold, copper, asbestos, and silver. The value of the production of these in 1920 was:

Coal	$77,326,853
Nickel	24,454,597
Gold	15,853,478
Copper	14,166,479
Asbestos	13,677,841
Silver	12,908,683

The known mineral resources of the country are great, and an immense area remains unprospected. The area of Canada exclusive of the islands to the north exceeds 3.000,000 square miles, a great part of which has not been carefully prospected. It is estimated that 900,000 square miles remain unexplored.

Barite

Barite has been mined for a number of years from veins near Lake Ainslie, Nova Scotia. Shipments have also been made from a vein cutting Precambrian rocks in Langmuir township, northern Ontario.

Chromite

Chromite is found in the Eastern Townships of Quebec. It occurs in irregular bodies in the peridotite and as disseminations through the rock. Some of the ore is sufficiently pure for shipments as mined, but concentration is generally necessary. The mineral occurs also in Ontario and British Columbia and in the latter province a small quantity has been mined. Nearly the whole production, however, comes from the province of Quebec.

Cobalt

Arsenides and sulpharsenides of Cobalt are found associated with silver in the Cobalt mining camp, Ontario and cobalt is recovered at the refineries. This has been for some years the principal source of the world's supply of this metal. Cobalt is used as a coloring agent in the enamel, porcelain, and glass industries. It also enters into the manufacture of stellite, a cobalt-chromium-tungsten alloy, used in making high-speed, cutting tools and, on account of its resistance to oxidation and corrosion by acids, for a very fine grade of cutlery.

Feldspar

Feldspar for use in the pottery industry is quarried in eastern Ontario, and southern Quebec. This mineral occurs in pegmatite dykes in rocks of Pre-Cambrian age. It is usually associated with quartz, and to a less extent with hornblende, mica and other minerals. For economic purposes the crystallization must be sufficiently coarse to permit of ready seperation of the feldspar from other minerals by hand, at the quarry. Quebec produces a fine grade of white potash feldspar for use in the dental industry, in the manufacture of artificial teeth.

The shipments during 1920 amounted to 36,856 tons valued at $274,075, of which 649 tons were from Quebec, and 36,207 tons from Ontario.

Fluorite

Fluorite, more commonly known as fluorspar a non-metallic mineral used in the manufacture of hydrofluoric acid, and as a flux in metallurgical processes, occurs in the vicinity of Madoc, Ontario, in veins ranging from a few inches to several feet in width, and cutting limestones of Ordovician age. Production has been intermittent, but was greatly stimulated by the high prices occasioned by war conditions. A deposit near Grand Forks, British Columbia, was opened in 1918, and operations have developed that will provide for a considerable export, in addition to supplying the metallurgical works at Trail. In 1920 the total production was 11,229 tons, of which 3,752 tons valued at $68,475 came from Ontario and 7,477 tons valued at $191,-171 from British Columbia.

Kaolin

A fine quality of kaolin is mined at St. Remi d' Amherst in southern Quebec, northwest of Montreal. It occurs in a shattered zone of quartzite rocks of Pre-Cambrian age, and a very pure granular

(Continued on page 37)

Basic Electric Furnace for Cast Iron

Particularly Adapted to Taking the Melted Iron From the Cupola and Refining and Superheating It

IN THE last issue we were shown the advantage of the electric furnace worked in conjunction with the cupola furnace, for superheating the melted iron, for desulphurising and refining it, and in a general way in proving the product of the cupola by taking it in a melted state and putting it into the electric furnace, where it will be subjected to the heat of the electric arc. This will now be continued.—Ed.

The important characteristics of refining in the basic-hearth electric furnace are:

It is strongly reducing.

It is degasifying to an appreciable extent.

It is cleansing of entrained slags and oxides.

It is intensely desulphurising.

There are metallurgists who insist that oxygen can be a very beneficial element in cast iron, but the writer is not among those who subscribe to the extreme theories of this group. It is probable that oxygen strengthens iron by assisting the retention of carbon in the combined form, but we fear this is at too great cost and that the gain is problematic. Oxidised iron is the natural product of a badly performed cupola, and is readily recognised by its treacherous lack of fluidity in spite of apparently high temperature. Oxygen seems to raise the solidifying point of iron, making it sluggish and producing castings of unreliable mechanical properties. While such iron itself may be strong, its castings are liable to be openly or internally defective through flaws born of non-fluid metal.

The importance of the question of oxygen in cast iron cannot be over-estimated, but at present metallurgists and foundrymen are sadly handicapped in their investigations by the lack of ready and reliable means of determining the full amount of oxygen. There is no analytical way open by which one can study completely the oxidation of iron or uncover the mysteries shrouding the mechanism of the methods that are used for its deoxidation. There is reason to believe that oxygen can be present in iron in three conditions, namely, (a) mechanically enclosed gases such as CO_2 and CO, (b) gases in solid solution, and (c) oxides of iron, manganese, silicon, etc. The only means for determining oxygen in iron that seems to be in practical operation is the admittedly imperfect Ledebur method, which reaches only the lower oxides of iron, the CO_2 and a part of the CO, missing completely the oxides of manganese, silicon and titanium. Analyses for Ledebur oxygen in grey iron from both stages of the duplexing process indicate that such oxygen is reduced by the electro-furnace stage of the process to from one-sixth to one-third of what it was upon leaving the cupola. Visibly this change manifests itself by increasing fluidity, an iron low in iron oxide being more fluid than one high in oxide with temperatures the same. Therefore the basic electric furnace is seen to have a two-fold influence for increased fluidity, namely, by raising the temperature and by decreasing the oxide.

Of the effect of the electric furnace upon the other gaseous constituents of cast-iron nothing is known except upon nitrogen, concerning which the writer has some scant analytical data. Like oxygen, this element probably exists in several forms in cast iron. The only form that seems to be within reach of the analytical chemists is combined nitrogen, probably nitride, which responds to analysis by the Allen method. The nitrogen as determined by this method in a number of samples of grey iron melted in the usual way in the cupola, ran from 0.008 to 0.012 per cent., whereas after refining the same irons for about thirty minutes in the basic electric furnace. it was found to be from 0.004 to 0.006 per cent.

There is no doubt that from this viewpoint of economy the most interesting feature of refining in the basic electric furnace is desulphurisation. With the bath of sulphur-bearing iron at a high temperature resting upon a bottom of magnesite or dolomite, under a chemically active blanket of calcareous slag, the transfer of sulphur from iron to slag is facile, rapid, and certain. Given the proper conditions in furnace and slag, none of which is difficult to attain, the diminution of sulphur is merely a question of a short time. The following is illustrative of the progress of desulphurisation in an iron fairly rich in sulphur:

0.156 per cent	As received from cupola	
0.133	"	10 minutes.
0.112	"	20 "
0.079	"	30 "
0.036	"	40 "
0.031	"	50 "
0.014	"	64 "

In this case but one slag was used. The heat was continued further than commercially necessary, and for practical purposes could have ended after 30 minutes.

The chemical reaction by which sulphur is removed in the basic-hearth electric furnace is as follows:

$$FeS + CaO + C = Fe + CaS + CO; \text{ or}$$
$$MnS + CaO + C = Mn + CaS + CO.$$

That the full reaction is more complex than here indicated is probable, although its essential outline is as given. Its significant feature is that sulphur is taken from the iron as insoluble calcium suphide, which, however, is soluble in the slag. The key to the reaction is the fact that desulphurisation is impossible except with deoxidation, the two going hand in hand. The deoxidising condition is readily obtained by enriching the slag in carbon through the addition of coke dust. Combining with lime the carbon forms of calcium carbide whch is the necessary agent for the required degree of deoxidation in the metal. Calcium carbide is made possible by the high temperature of the electric-furnace. Were the conditions oxidising, the calcium sulphide would be oxidised to sulphate, which would react with the iron to form iron sulphide once moer, and as such the sulphur would re-enter the bath. Here is a refining reaction that is thoroughly deoxidising, and therefore incapable of harm to the metal.

This ready method of ridding cast iron of the most of its sulphur is of vast and growing importance in current times. The accumulation of sulphur in the world's scrap heap is becoming a problem. Every remelting increases its sulphur, and metallurgists foresee a time when the heap-up sulphur will be a veritable menace. Much poor, high-sulphur coke was used in foundries during the war, and eventually all this sulphur will find its way back to the foundry contained in scrap. Those who use a large proportion of pig iron in their mixtures say there is no sulphur problem for them, but transportation charges universally are becoming so high that some of these for financial reasons may be forced sooner or later either to move nearer to the source of their iron supply or to make use of the scrap near at hand, which last condition means that they then must face the sulphur problem. Also they may come to the use of more scrap on the ground that it is an economic duty for every foundry to use a just share of the world's huge scrap pile. At all events, in the morld of cast iron the accretion of sulphur is a menace that looms up in the near future.

The question arises as to how far desulphurisation should be carried. The greatest reduction of sulphur in grey iron made by the writer was from 0.171 in the cupola melt to 0.013 per cent. in the same iron refined in an electric furnace, with a single slag in eighty minutes. The lowest sulphur attained was 0.009 per cent. in some steam-valve castings that probably are the lowest-sulphur grey-iron castings ever made. This extremely low sulphur is reached only by the expenditure of much time and electricity, and, moreover, is not recommended to the average foundry at present, nor until our knowledge of the benefits of extremely low-sulphur iron has expanded beyond its present confines. An iron casting with 0.030 per cent. sulphur contains about 0.018 per cent by weight of structurally face sulphide of sulphur be doubled the amount

of sulphide till be inconsequential, and we doubt if the difference between these two sulphur contents can be measured in the mechanical properties of the castings. However, increase the sulphur to 0.1000 per cent. or over, and the resulting 0.27 per cent. or more sulphide becomes a sinister factor to be reckoned with.

Our opinion is that if the sulphur is below 0.070 per cent. it cannot be considered dangerous in any ordinary grey-iron casting; above that segration is liable to occur with harmful results. Sulphurs of 0.050 per cent. and under are needed for only unusual conditions, and any advantage claimed for them is largely speculative. In the average foundry practical desulphurisation will consist in reducing sulphurs that originally are well over 0.100 per cent. to about 0.070 per cent. Such reduction simply means the making safe and useful irons that are otherwise openly dangerous on account of their hoard of sulphur.

An indirect benefit from reduced sulphur is a saving of manganese. This element has two purposes in iron—to deoxidise, and to minimise the evil effects of sulphur. One part by weight of sulphur is taken in charge by about 1.7 parts of manganese, to form 2.7 parts of manganese sulphide, the advantage of the reaction being that it takes place to the exclusion of iron sulphide. The excess of manganese from this reaction helps from the double carbide of iron and manganese. It is well known that manganese carbide is harder than iron carbide and the hardness of iron castings, especially small ones, is thereby considerably influenced. Therefore a reduction in sulphur may result in an increase in manganese carbide with a parallel increase of hardness.

To consider this situation more mathematically let us assume a grey iron with 0.080 per cent. manganese and 0.130 per cent. sulphur This amount of sulphur requires 0.22 per cent. manganese, forming 0.35 per cent. manganese sulphide, while the remaining 0.58 per cent. manganese unites with carbon to form manganese carbide. If the sulphur in this iron be reduced to 0.050 per cent. there is needed only 0.085 per cent. manganese to account for it, and the amount left free to form carbide is increased to 0.715 per cent. This reduction of sulphur therefore directly causes an increase of nearly one-fourth in the amount of manganese carbide in the iron. Quite probably this change would not be noticed in the hardness of fairly large castings, but there is ample experience indicating that in small castings it is liable to become embarrassingly noticeable.

In the case of sulphur reduction assumed in the foregoing paragraph the amount of manganese carbide can be kept at its original figure by making the manganese correspondingly lower to agree with the reduced sulphur. That is a manganese content of 0.665 per cent. will with 0.050 per cent. sulphur give the same amount of manganese carbide as 0.80 per cent. does with 0.130 per cent. sulphur. In practice this condition is taken care of by using lower manganese irons to begin with whenever electric furnace refining is to follow the cupola operation. This lowering of manganese is accompanied often by definite economic advantages in the purchase of raw materials.

The fact is the electric furnace conserves manganese in several ways, and lower manganese specifications become compatible with good castings. In the electric furnace all the harmful effects of oxidation in the cupola are wiped away, making unnecessary as much manganese as formerly was needed. Excellent grey iron has been made by this process with much less than the 0.50 per cent. manganese that has long been considered the lowest safe limit. Another benefit of the deoxidising influence of the electric furnace is the absolute immunity of the manganese from loss during the iron's stay in the furnace.

Considering some of the other elements in cast iron, we find that carbon may be reduced or increased at will. Ordinarily in an electric furnace free from rusted material it remains unchanged. Reduction of carbon is possible in two ways, by dilution with steel added in the electric furnace which should be the preferred method, and by the addition of predetermined but never very great amounts of iron ore or scale, removing some of the carbon by oxidation. This last operation is familiar to steel makers, but for grey iron should be resorted to with caution. Dilution with steel especially furnishes an attractive method for the production of so-called semi-steel of a quality and uniformity not possible by the old method in the cupola.

The element phosphorus in grey iron is not effected in the basic electric furnace. This is contrary to the belief of many who are more familiar with the dephosphorisation of steel. Before grey iron could be dephosphorised, the bath would have to be reduced in carbon and silicon until it became a veritable steel; then by oxidation and removal of the slag the phosphorus could be removed, after which the carbon and silicon would have to be restored. Plainly dephosphorisation of grey iron in the electric furnace is not economically possible. Like carbon, however, it can be reduced to a limited extent by dilution with steel.

Silicon in grey iron may be varied at will to suit the size and nature of the castings. It is controlled in the cupola phase in the usual way, and by making additions of ferro-silicon in the electric furnace.

The table on page 17 gives at a glance the results obtained by duplexing several lots of grey iron. The last heat on the list is an exception, being a heat of scrap metal that was melted from a cold charge in the electric furnace. Analyses and transverse strengths are given of the irons before and after going through the electric furnace phase of the process. The transverse tests were made with the "arbitration bar" that is standard in the United States, the bar being 1¼ in. in diameter, 15 in. long, and tested upon supports 12 in. apart. The interesting fact about the test is that the duplexed iron is uniformly stronger than the cupola iron, the average increase being about 33 per cent. Another interesting fact typical of a great number of heats is shown in heat 2221 where a substantial addition of silicon made in the electric furnace was accompanied by an increase in strength that would be entirely unlooked for under ordinary conditions on acount of the expected effect upon the combined carbon in the casting.

The cost of the electric furnace dup-

THE BASIC HEARTH ELECTRIC FURNACE AND SOME PROBLEMS OF CAST IRON. TABLE SHOWS COMPARISON WITH CUPOLA.

Heat No.		Carbon.	Silicon.	Manganese.	Phosphorus	Sulphur.	Transverse strength in cwts.
1221	Cupola ..	3.48	1.92	0.56	0.53	0.099	25.1
	E.F. ..	3.38	1·82	0.61	0.51	0.022	36.7
1281	Cupola ..	3.50	1.79	0.54	0.62	0.158	24.7
	E.F. ..	3.22*	1.94†	0.54	0.61	0.052	35·5
6271	Cupola ..	3.35	1.91	0.72	0.59	0.091	33.4
	E.F. ..	3.26	1.77	0.73	0.58	0.018	45.5
1721	Cupola ..	3.40	1.94	0.42	0.58	0.069	32.1
	E.F. ..	3.41	2.21†	0.44	0.56	0.026	37.6
8172	Cupola ..	2.90	1.54	0.43	0.54	0.151	—
	E.F. ..	2.91	2.28†	0.51‡	0.55	0·013	37.5
8182	Cupola ..	2.77	0.89	0.24	0.44	0.160	—
	E.F. ..	2.69	2.18†	0.52‡	0.40	0.057	45.6
3419	Cupola ..	3.39	2.16	0.77	0.62	0.057	25.1
	E.F. ..	3.14**	1.90	0.84	0.55**	0.019	34.1
2221	Cupola ..	3.45	1.83	0.34	0.48	0.112	29·5
	E.F. ..	3.38	2.30†	0.36	0.47	0.033	35.8
1191	E.F. only	2.94	1.52	0.62	0.27	0.009	37.0

* Carbon reduced by mill scale in electric furnace. † Ferro silicon added in electric furnace. ‡Ferro-manganese added in electric furnace. ** Carbon and phosphorus reduced by dilution with steel.

lexing process for cast iron is difficult to discuss because there are many important factors that are extremely variable. Among these are the size of furnace, cost of current, intensity of operation, degrees of superheating, and extent of refining necessary, and care and skill in operation. In the United States duplexing is being done at costs varying from six dollars to fifteen dollars per ton above the cost of ordinary cupola iron. Whether or not this added cost is prohibitive depends upon the nature of the castings.

It is hardly necessary to say that for ordinary castings made upon a strictly competitive basis the duplexing process cannot compete with or displace the cupola process. However, its use is feasible for extraordinary castings; for example, those requiring unusual physical properties such as tenacity, solidity and most rigid freedom from all kinds of flaws. Its use is feasible for making out of strong but highly non-fluid irons, castings that normally would be impossible for such irons. It also is economical for castings that are extremely expensive in every step of their production, as also it is for castings that, although by nature liable to defects, are not discovered to be defective until after much costly machine work has been expended upon them. In short, the duplex process is eligible wherever high quality or strong insurance against defective castings is desired. The time is not yet at hand to recommend the electric furnace for ordinary castings under ordinary conditions, but only to suggest it as a highly efficient adjunct to the cupola for extraordinary castings and circumstances.

Before closing we must sound the warning that the electric furnace is not a cure-all for the many ailments to which the iron foundry is heir. Its adoption is not a surcease from all care, for if not attended by experienced and intelligent metallurgical supervision, it can readily become the source of the greatest worry and disappointment. Efficient and versatile as the electric furnace may be, it still is comparable to a highly developed machine that can be placed with assurance only in the hands of trained and intelligent operators. It needs the help of sound metallurgical sense, well directed thought and study, and at times even of constructive imagination.

In closing, the writer makes pleasurable acknowledgment of an indebtedness to his friend and associate Mr. S. J. Felton, whose suggestions, especially concerning the temperatures of molten iron, were extremely helpful.

PLATING AND POLISHING DEPARTMENT

Question.—In the manufacture of cast iron parts for munitions we have considerable difficulty from water stains on the copper deposits. Daily cleaning of the hot water tank has not proved very helpful. May we have your assistance in choosing an effective drying method for this particular purpose?

Answer.—Remove the coppered articles from the plating bath, rinse in cold running water and immerse in hot water containing about 4 oz. of neutral soap per gallon. Remove and quickly rinse in clean hot water and dry by means of compressed air blast. Then lacquer by use of spraying apparatus. Compressed air is the most satisfactory method of removing moisture from the small recesses of certain parts of munitions, etc.

Question.—Our plating dynamo is a multipolar compound wound three-wire machine and we have copper and nickel baths connected to the two five-volt circuits, while the ten-volt circuit operates an electrolytic cleaning bath. Since using the ten-volt circuit more or less constantly we notice a serious drop in voltage over the entire system whenever the ten-volt circuit is in use. This condition naturally retards the speed of deposition in the plating tanks and in trying to remedy matters we tightened all drive belts, but with no beneficial results. The trouble is evidently in the machine. We would appreciate the advise of your correspondent regarding this question.

Answer.—As you do not state the capacity of your machine or the total current employed we must simply read between the lines of your letter for a general idea of your conditions. We therefore advise you to thoroughly clean the dynamo, remove and wash all brushes, inspect all connections of dynamo and external circuit. If commutator is rough, smooth it off with fine sandpaper. Replace brushes and use utmost care in proper adjustment of same. Lubricate the commutator with engine oil by applying the oil with a piece of felt or cheese cloth. Do not apply oil too freely, try the machine with full load and if all is well you may rest assured that cleanliness and proper lubrication of commutator are esssential to the successful operation of the dynamo under maximum load. We are confident this will end the trouble.

Question.—Is nitre cake a Canadian product? What is its source and how is it used in commercial practice for sulphuric acid?

Answer.—Nitre cake is crude acid sodium sulphate, and is a very variable substance. The free acid found therein may vary from 5 to 30 per cent. It is a by-product obtained in the manufacture of nitric acid and it is produced in Canada in considerable quantities. Before the war the demands for this product were not sufficient to promote interest in the material. It is now used in the manufacture of paper and its use as a substitute for sulphuric acid in the pickling of metals is only of minor importance to the producers. It is used in aqueous solution at a temperature of 212 deg. F. for pickling. Metal surfaces should be free from oils, greases, etc., to facilitate rapid action in pickling. It is of especial value in pickling annealed brass. The acid content should be maintained at from 3 to 5 per cent. by addition of fresh nitre cake. There is no gain in using a more highly concentrated solution. More rapid results are obtained by either agitating the solution or moving the metal undergoing treatment. The solution may be used with the electric current if desired, thereby effecting very rapid and thorough pickling at no extra expense excepting for power and in many shops this item would be negligible, as current from ordinary plating generator is all that is required.

A NOVEL IDEA

Here is an idea that is to my mind novel, but well worth a trial. It has been developed by the workers in a machine ship in a small town in Ontario, and has been found to give satisfaction all around. The illustration shows the idea. Alongside of the regular time cards were placed what we termed "bank cards." One of these is shown in the cut. When a workman put in any overtime, he rang in the bank card instead of the regular one.

The foreman kept a bank book, as we called it, and in this book was entered the time spent by each worker on overtime in the week. When a man needed a day off through sickness, or had to take time off for any other purpose, the foreman was notified, and then the worker's regular card was rung in by the foreman himself, just as if the worker had been on the job. This amount of time was deducted from the bank book and thus the men were assured of a more steady and regular income. Of course, we were allowed the added rate for overtime, and the deductions were made in proportion. During the winter and spring we put in considerable overtime, and thus the summer holidays were provided for.

It was not compulsory for the men to use the system, but was adopted by all, as it worked out so well. When an employee left, or was laid off, he was paid what was due him at the regular overtime rate.

Protect Your Feet from Serious Accident

Shoes Which are Beyond Service for Dress Purposes Will Often Cost More in the Foundry Than Would Buy First Class Molder's Gaiters

This heading is adopted by the Ontario Safety League, the Canadian National Safety League, etc., as a warning to working men to be careful about using shoes which have served their purpose.

It is not the purpose to boost any shoe manufacturer's particular brand of shoes, but simply, from a humanitarian standpoint to warn against the false economy of trying to make shoes serve after they have become dangerous. Wet feet are among the most dangerous of forerunners of serious sickness, and shoes such as the ones shown in the illustrations are the kind which will always contain wet feet if used where any moisture is to be picked up, but this is not a serious feature in the foundry. What interests the foundry workman is to protect his feet from the dangers of melted metal and red-hot sand.

Take a good look at each one of these shoes and see if you do not identify them all and remember a little high-stepping experience which they brought you.

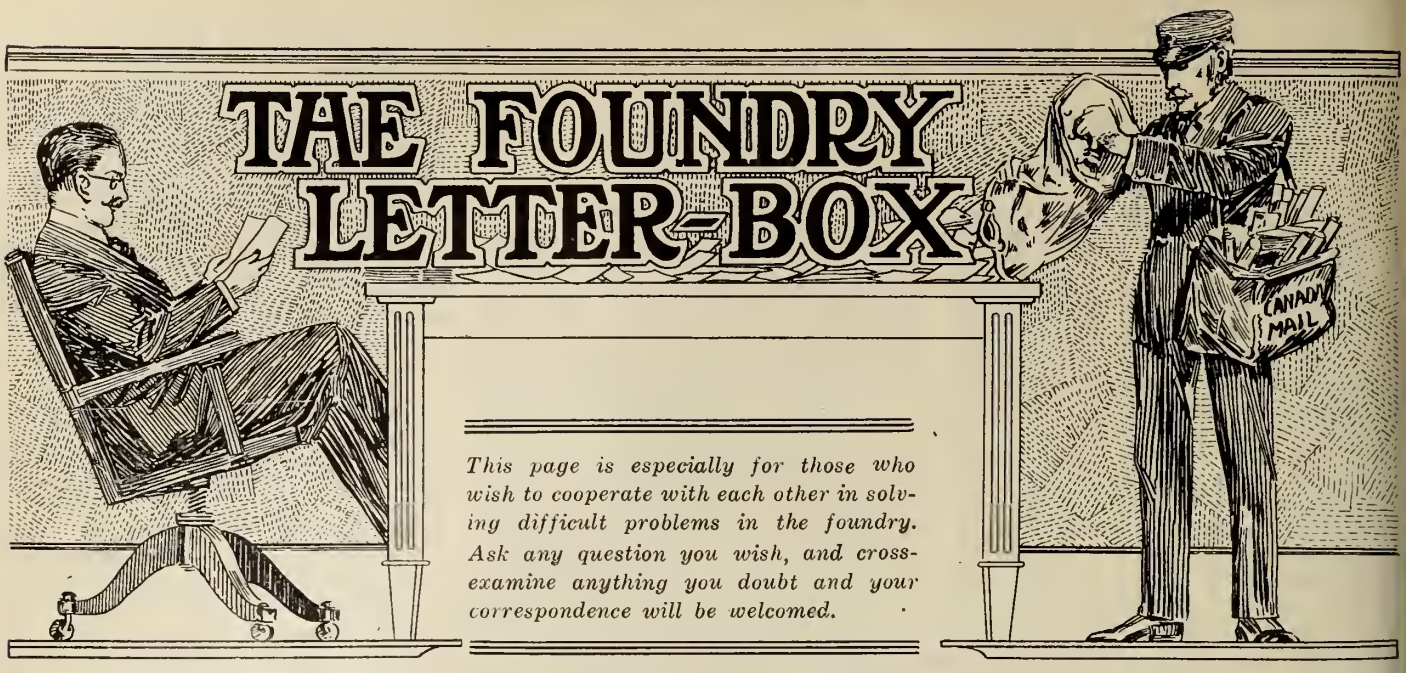
The working man with a family to support knows the value of a dollar and hesitates at making expenditures which he does not feel are absolutely necessary. His first thought of economy is in connection with himself and his own wearing apparel, and if he has a pair of laced shoes which have become shabby and can no longer be used for dress purposes he cannot resist the temptation to take them into the shop, where they soon get to look like the illustrations shown. These shoes, if taken into the foundry when new were not suitable for the work. In the first place the material from which they are made is not sufficiently heavy to stand the work, and in the second place laced shoes should never be used in a foundry as hot iron and hot sand will get in around the tongue and laces When a shoe gets worn so as to have holes in bottom or anywhere else, if it is not a good enough shoe to be worth repairing it should be thrown away at once. No matter how careful a molder may be he is liable to make a mistake or have an accident, and as is the case with all callings, he is liable to be the victim of some one else's mistakes. If provided with shoes like the second illustration he is fairly well insured against the chief causes of trouble. This, as will be seen, is a molders' gaiter with elastic sides. Even the cheapest gaiter is superior to the most expensive laced shoe, but it is not the cheapest in the long-run to buy the cheapest gaiter. This gaiter represents the most approved type of foot-wear (1) shows vamp cut in one piece—no seams and no thread to rot out leaving an opening for hot stuff. (2) shows two full soles, the outer sole being especially tested to resist effects of heat and water. (3) shows strong box toes, a protection against falling material. (4) shows the square cut top which more effectually prevents hot metal or sand from getting into the shoe.

Too little attention is given to hot sand. Melted metal is universally feared, yet hot sand will sometimes make trouble where melted metal would not. Any molder, even though he does not do his own shaking out is liable to lift off an occasional cope to see his casting, and some hot sand will fall on a shoe which would shed the melted iron but which will admit the hot sand in some little cracks, and a painful burn be the result. A man is not likely to step into hot iron, but he may unknowingly step into hot sand, in which case a shoe with a bad sole or with a bad upper will admit enough to make him step lively. Take warning and protect your feet from accident.

The new safety shoe for molders. Note its many advantages.

SLUSH CASTING

Slush casting, or casting hollow, white metal objects without a core is an interesting process which should be encouraged more than it is. Many ornamental castings such as the images which are so often seen on top of parlor stoves, etc., are made by pouring the melted metal into a brass mold. The mold must be in two halves and part where it will most easily allow the casting to be removed. The mold is placed, bottom end upward and this end must have a fairly high risor of nearly the same diameter as the base of the casting. This is for a feeding head as well as a pouring gate. After pouring, the casting is allowed to stand a few minutes until the brass mold absorbs sufficient of the heat from the casting to form a crust on it. A hole is now punched in the top of the riser and the mold turned upside down when all the metal will run out of the inside. The trouble is that a crust is formed on the riser as well as on the casting and this has to be cut off. This if done in the ordinary way of sawing and grinding would be a bigger job than all the other work combined. To overcome this a ring core is made to fit in the neck of the riser where it joins the casting. This core is made with asbestos dust as part of its composition. The asbetos core being a poor absorbant of heat it allows the ring of metal which is in contact with it to remain fluid for a longer period of time than is required for the casting, and when the casting is taken from the mold the riser will fall off.



This page is especially for those who wish to cooperate with each other in solving difficult problems in the foundry. Ask any question you wish, and cross-examine anything you doubt and your correspondence will be welcomed.

MELTING GREY IRON IN THE ELECTRIC FURNACE

Editor Canadian Foundryman:—In your September issue, page 32 appears an article by H. C. Bromer on electric furnace melting of iron. The article is interesting enough and will no doubt tend to spread knowledge of what is being done with electric furnaces in the iron foundry.

A point, in the article, however, to which very many of your readers will take exception is the use of the trade name "Lectromelt" to a perfectly well known and simple metallurgical operation—viz., that of electric melting of iron scrap. Several times in the article we are referred to this trade name as designating "Special Iron," a "Process," "Castings," "metal," "Grey Iron," "temperature," a "furnace" and "iron." The particular type of electric melting furnace used does not in any way warrant our speaking of it as a "Smith's iron," "Smith's temperature regulation," "Smith's process," "Smith's Grey iron," etc.

The actual furnace is merely a three-top electrical furnace based on the twenty-year-old invention of the well known French scientist, Dr. Heroult. The actual process described as being special to the one trade name has been done by every other manufacturer of electric furnaces—in either one, two, three, or four electrode furnaces, and to the best of my knowledge, no one has previously thought it necessary to invent a new grade of grey iron, of temperature, or of a process, by tacking on his private trade mark.

Years before this particular trademark was thought of, we were melting up iron borings, refining hot cupola iron and following the process described in the article at the Daimler Motor Co's. works at Coventry, England, at the Leyland Motors, Ltd., Leyland, England, at the Ford Motor Co., Detroit, and at numerous other works.

In each of these cases a basic lined "Greaves-Etchells" electric furnace was used and in the great majority of cases, for iron melting a basic lined furnace with a bottom contact and consequent slow circulation of the bath from the bottom will be found of greater utility to the average foundryman than a fast melting instrument.

For a plain melting down proposition with no refining, an electric furnace builder would put in an acid-lined three-top electric furnace and in connection with this the furnace described in the article is no better than any other three electrode furnace. Rate of melting when exactly the same principles are involved. then resolves itself into the capacity of the transformers behind the installation. For an article of real merit I would refer your readers to the very excellent paper given before the British Foundrymen's Association by Mr. G. K. Elliott on the subject of grey iron melting in the electric furnace. Mr. Elliott is a practical investigator and his conclusions are based on real metallurgical knowledge. The field is wide open for the electric furnace for iron, but let us forget these secret processes and use horse sense.

Frank Hodson

Mr. Elliott's paper which Mr. Hodson refers to was given in part in last issue and is continued in the present issue.—Editor.

THE UNSKILLED LABORER

Not wishing to take any side on the so-called labor agitation and not wishing to pass an opinion on the subject of machinery as compared with mauual labor, I want to ask a few questions on the subject which I have put as a heading to this article. Now to begin with, is it conceivable that in this twentieth century and in a civilized land, such an indiv dual as an unskilled laborer should exist? Should such a being be allowed to exist? Is it to anybody's advantage that such a class should dwell in our midst? Is it honest to take advantage of such a man's misfortune and pay him a wage which will force him to raise his family along the same lines on which he was raised?

We have made laws which forbid him from putting his children to work before a certain age and the law requires that they attend school during that time thus putting them in the educated class. But what good can a boy get from his education if he goes out into the world, an unskilled laborer? In every line of industry this man is spoken of more than any other man in the organization. In fact, he cuts a bigger swath than all of them put together. The whole aim in fitting up a plant is to simplify the work, and specialize to such an extent that skilled labor is not required. In installing machinery, the idea seems to be to get the machines so perfected that any unskilled laborer can operate them, and so on it goes down the line; the unskilled laborer is the most sought-after man in the country. Now what is the result? And what result was expected? The intention, no doubt, was to get the work done cheap so that the employer could reap bigger profits, and of course there is the possibility that in the event of the skilled workmen going on strike, the unskilled man could take his place. Has anything been accomplished along these lines, and if so, has it benefited anybody? Now to answer all these questions we might say that it has put the world in an uproar where nobody is satisfied and where every class is organizing to fight everybody else. It is also next to impossible to buy anything which is worth carrying home.

We often hear manufacturers say, "We can get all the help we want but we can not get the kind we want." The all-round man is rapidly becoming a thing of the past. Conditions have arrived at the state where the positions formerly filled by mechanics are now filled by laborers with the result that few recruits are available. Boys prefer to take up the professions and in spite of the fact that every precaution was taken to have a supply of unskilled laborers they are getting scarce along with the mechanics, while the professional man is becoming a drug on the market. The professional man from sheer necessity has had laws enacted to protect him, which only aggravates the matter by increasing the number of professional men, but I am getting away from the subject. With due respect for the professional man and the mechanic, I can not look with favor on the idea of encouraging a continuation of the unskilled laborer in our midst.

SKILLED LABORER.

SOME OF THE ECONOMIC MINERALS OF CANADA

(Continued from page 31)

quartz is obtainable as a by-product. The kaolin is used in the manufacture of paper.

Mica

Mica was produced to the extent of 2,150 tons in 1920, valued at $368,297. It is mined in eastern Ontario and southwestern Quebec. The crystals from which the commercial sheets are split occur in rocks of Precambrian age, as scattered crystals or in irregular aggragates, or in veins, the size, form and composition of the deposit varying greatly in different localities. The deposits consist mainly of phlogopite (amber mica) apatite, pyroxene, and calcite but the relative abundance of these minerals varies greatly, in some cases apatite being rare and other cases predominating over the mica. They occur in pyroxenite or in other rocks closely associated with the pyroxenite. The pyroxnite is thought to have been derived from Granville limestones by the tic solutions given off by intrusives. Accompanying and following the formation of the pyroxenite came the development of the mica and apatite.

Molybdenite

Molybdenite, a compound of molybdenum and sulphur is the mineral from which the molybdenum is obtained that enters into the manufacture of the special variety of steel known as molybdenum steel. This mineral has long been known to occur in Canada. The deposits are, however, in general low grade and it was not until an insistent demand was created by the conditions arising out of the declaration of war that mining operations on the Canadian deposits were conducted on any considerable scale. During the war small shipments of ore were made from British Columbia, but the greater part of the production came from the province of Ontario and Quebec where concentrators were erected. The production reached its maximum of 378,029 pounds of concentrates in 1918. The price of molybdenite has dropped to a level that makes the mining of the low-grade Canadian ores no longer profitable.

Molybdenite is found in pegmatitic rocks, in quartz veins, in coarsely granitic phases of acid igneous intrusions, and as contract metamorphic deposits.

Pyrite

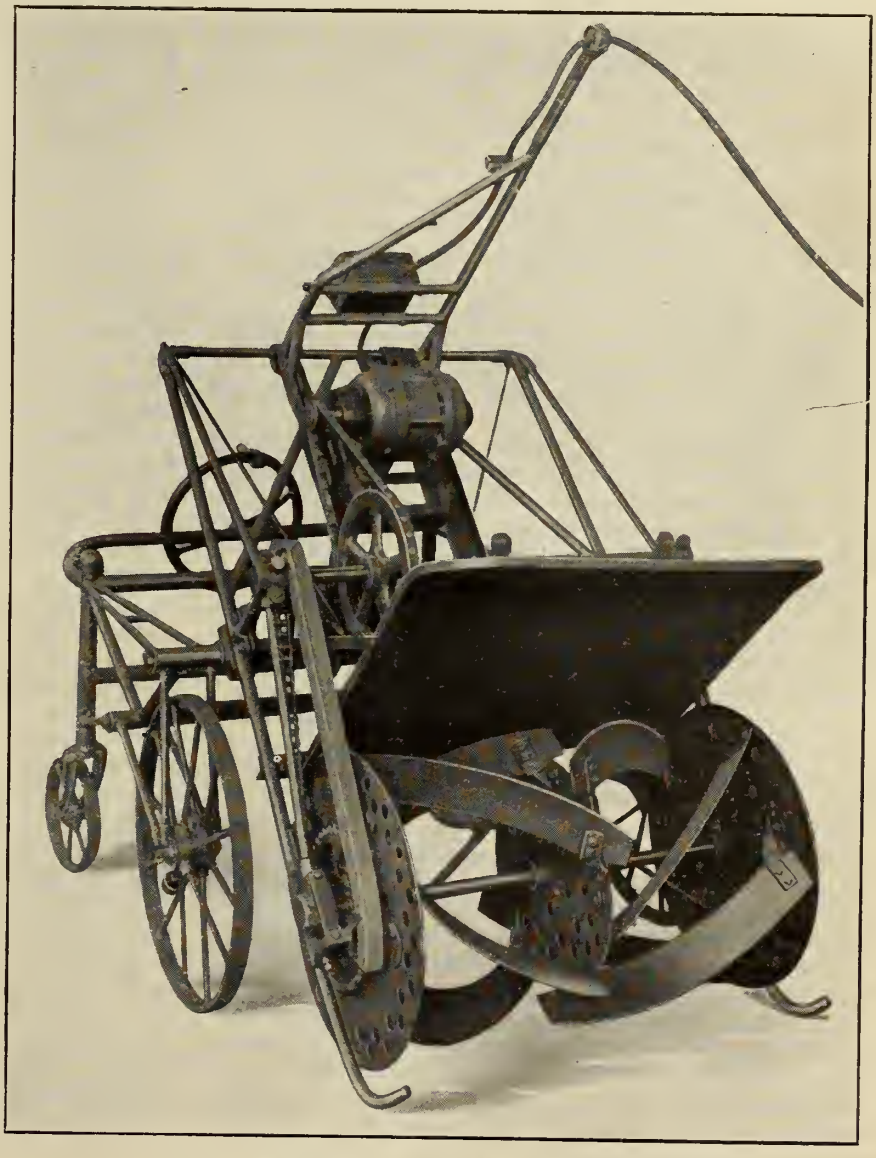
Pyrite is a compound of iron and sulphur. It is burned in specially constructed furnaces for the production of suphur dioxide gas for use in the manufacture of sulphuric acid. A small amount is mined on the Pacific Coast, but most of the Canadian output comes from Ontario and Quebec. Many of the deposits are large, and carry reserves sufficient for many years production. The abnormal conditions occasioned by the war greatly stimulated production and in 1917 a maximum of 416,649 tons was reached. The total shipments for 1920 amounted to 174,744 tons valued at $751,009. Of this, Ontario contributed 148,652 tons. Quebec 14,817 tons, and British Columbia 11,275 tons. Only sixteen per cent of the ore was used in Canada, the remainder being exported to the United States.

These are just a few of the less familiar metals which are found in Canada. In the next issue of this paper will be published some data on the metals for which Canada is world-famous.

Exactly So

"Nature," exclaimed the philosopher, "always tries to make compensation. For instance, if one eye is lost, the sight of the other becomes stronger and if a person grows deaf in one ear, the hearing of the other becomes more acute."

"Faith," said Pat, "and I believe you're right, for I've noticed that when a man has one leg shorter, the other is always longer."



Another view of the sand cutting machine shown on Page 25.

F. H. BELL, Editor

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Foundrymen's Convention in April

CANADIAN FOUNDRYMAN readers and all others interested in the foundry business will be pleased to learn that a place and date have been selected for the next convention and exhibit of the American Foundrymen's Association. The City of Cleveland has been selected and the convention and exhibit will be held during the week of April 24, 1922.

The association headquarters and exhibits will be in the new Cleveland Public Hall at Lakeside Ave. and E. 9th St., which is rapidly nearing completion. The Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers have announced that they will hold joint convention with us as has been their custom in years past.

Of the cities considered, Cleveland is most centrally located for the membership, for the foundry industry, and for the manufacturers of foundry equipment and supplies who make annual exhibits, and its selection will conserve travelling and freight expense.

The new Public Hall is only a few minutes' walk from the downtown hotels, and is directly across the street and within the pitch of a quoit from the old Central Armory where the first foundry equipment exhibit was held in conjunction with the meeting of the A.F.A. in 1906.

Following an interval of eighteen months the next meeting promises to be of unusual interest and profit. The Papers Committee advises that manuscript copies are being received and that the first set of blueprints of papers to be presented at the convention will be mailed out in January.

There never was a period when economy in production counted for so much as now. At the coming exhibit will be displayed all the latest improvements and inventions in foundry equipment. Full detailed announcements with hotel and railroad rates will be made in our next issue.

As we pointed out a short time ago, a convention held this Fall might not have been up to its usual standard and if it could not follow in the regular course and surpass everything which came before it, a better course would be to hold off until such time as this could be guaranteed. The time has now come when this can be done, and the next convention and exhibit will be the biggest and best in the history of the association. We earnestly urge all our readers to use their influence to have the Canadian contingent to make a creditable showing. There is nothing which will put confidence in the public and revive the foundry business like making this event a real success.

The Value of a Museum

THERE are few people who do not enjoy looking through a museum and gazing in awe at the handiwork of those who dwelt upon the earth in years that are gone, or to look upon the bones of animals which roamed the earth long before history began to be recorded. Almost any visitor in a strange city seeks out the museums among the first things to be visited. In fact we belong to that class ourselves.

A few months ago we had occasion to visit the city of Chicago, and as usual visited a museum and inspected some specimens of ancient foundry work an account of which we considered worthy of publication. These specimens we have been illustrating in connection with short stories in the hope of interesting our readers in the most interesting of callings, that of metal working. These stories have been well received and we have been urged to continue their publication. A couple more will be published, after which it is proposed to show a few specimens from the Royal Ontario Museum, Toronto.

The objects selected from the Chicago museum show civilization as it existed in the Roman Empire two thousand years ago, while the ones which will be chosen from the Toronto Museum will show Chinese handicraft in the metal field, even further back than the former and right on up to a comparatively recent date. The Chinese are a wonderful people, far beyond what we are apt to give them credit for being. China dishes as the name implies, originated in China, and in this line the Chinese still excel, but their greatest achievements have been in the production of glass. Since the overthrow of the Chinese by the Manchurians in the 16th century very little progress has been made, but even during those times the quality of the glass which was made in China has never been approached by any other nation. We will not dwell on these subjects however, as they are outside of our field, but the bronze statuary, bells, tools, utensils, etc., which were modelled and cast as far back as five thousand years ago will be of interest to foundrymen.

It may not be generally known even to Canadians that we have so interesting a museum as we have. The Royal Ontario Museum was established in the year 1912 under an act of the Legislature Assembly of the Province of Ontario for the purpose of collecting and exhibiting objects in illustration of the Natural History of the World and the History of Man in all ages.

The museum is governed by a board of trustees representing both the province of Ontario and the University of

Toronto. The cost of the erection of the building as well as the annual charges for maintenance are borne in equal parts by the Province and the University.

Many of the exhibits originally formed part of the University collections and were transferred to the Museum at the time of its establishment. Much of this material, as well as many more recent additions, has been acquired through the generosity of private individuals and friends of the Museum. The Board of Trustees desires that the public regard the museum as a repository for individual specimens and collections. The preservation of such material is one of the chief functions of a museum, and it is largely to this source that the Royal Ontario Museum looks for its future expansion.

The act establishing the museum confers on the Board of Trustees the authority to establish independent museums devoted to special objects, and to be known as The Royal Ontario Museum of whatever objects are chosen. So far five different museums are included, namely:—Archaeology, Geology, Mineralogy, Palaeontology and Zoology.

The present museum building which occupies the western portion of an imposing site on the corner of Bloor St. and Avenue Road, directly north of Ontario Legislature buildings, constitutes the west wing of the proposed structure, which, when completed will be in the form of a quadrangle and will occupy the ground between the part now constructed and Avenue Road. Exclusive of the offices, the present building is 340 feet by 60 feet, giving with its four floors, a total area of 91,200 square feet. The whole of this area is available for exhibition with the exception of about two-thirds of the basement which is used for storage and for preparation rooms.

From the foregoing it will be seen that we have a fair sample of a museum and while all the departments are of exceptional interest, only one, that of archaeology, would be appropriate to a publication of this kind.

The lessons to be learned from the study of the material found in a museum are of real value if the human race only had the good judgment to profit by them. They show us that as long back as man has existed, two patent forces wrought to drag him down, no matter how he strove to rise. These two forces are, "Bigotry" and "Despotism," or in other words, Religious fanatics and military tyrants. On the one hand we see swords, spears, battle axes and various other instruments of death and torture, while on the other hand we see all manner of bronze, stone, and wooden gods; in many cases the former being brought into action to assist the latter. Thus while antiquities show us that the ancients were intellectual, they also show us their predominating weakness, which, allowed them to ascend to a certain eminence only to be dragged down. The same defect is still found in "man" and will probably continue for all time. Our neighbor is wrong if he does not think as we do and if we cannot bring him to our views by suasion we will do so by force, or go down in the attempt. The skill as well as the labor required to construct the bronze statues of Buddha, were enormous, and the nation, which constructed them, constructed the largest fortification ever known,(the Chinese Wall) yet with all their religious devotion and their military strength they fell to a considerable depth of insignificance, taking with them, much of their ingenuity and mechanical skill. The museum shows us what they were and what they might have been.

Patterns and Castings

FOR SOME months past we have been publishing a series of articles by Mr. W. P. Essex on foundry topics. Mr. Essex is a foundry historian of considerable merit and his articles are written in a manner which draws the reader along and makes him look forward to the next one, but he is a busy man and stress of business made it impossible for him to prepare an article in time for this issue. He is, however, still with us, and his contribution will appear in the December Foundryman as usual.

We have a few other things which we had hoped to feature in this issue but "The best laid plans of mice and men aft gang agley;" they will appear in the next issue. Our aim is to have sections of interest for the practical man both in the molding and pattern-making departments, particularly during the winter months, and this we intend to do.

What is the Cause of Depressions

A DEPRESSION and a panic are by no means the same. A panic is something really serious, but a depression is just a lull in business such as we have been experiencing for some months back, when nobody knows why they are not busy. The depression which we have been experiencing lately is not as severe as the one we had in 1913 or the one we had in 1907, but it is felt more because we had been having such exceptionally prosperous times so short a time ago. The cause of the present depression is a matter of conjecture, and many plausible arguments are put forward to explain it. One is that taking away the booze threw everything out of balance. The men who worked in boozeries had to seek other employment while the money formerly spent on John Barleycorn is now put in the bank and as a consequence is out of circulation.

Another is that the bootleggers have been doing the most thriving business of any of our business and have cornered most of the coin which was formerly in circulation, and now they are afraid to spend it for fear people will wonder where and how they got it.

Another and probably the nearest to the point is that the public has been reading Dickens' story of the ways of Wilkins Micawber. Wilkins was an optimist and he was honest. If he owed anybody, and he always did, he would pay him. He would cheerfully tender his I. O. U., and if the recipient never got the cash he could keep the I. O. U. But Wilkins had one peculiarity, he was always waiting for somebody to do something which would throw something in his (Wilkins') way, or to use his own words, he was "waiting for something to turn up." Something did turn up and Wilkins Micawber became a magistrate and ultimately a news-writer for a paper.

This seems to be the attitude of 'most everybody now-a-days, keep on waiting and somebody else will have to make a move which will bring something our way, or to quote Wilkins Micawber, something will turn up if we just wait. There is no possible doubt but somebody will make a shuffle some day and that things will be all right in time, but why so much procrastination?

The Annealing of Aluminum

ALUMINUM castings such as oil pans of motor cars are somewhat difficult to weld when broken, owing to the liability of the part drawing out of shape while cooling or cracking owing to the locked-up stresses. If the part changes shape much it will be impossible to reassemble it, and if held rigidly to a steel frame while cooling off so as to maintain the original form there is danger of cracking.

In this connection it is of interest to note a method employed by coppersmiths to anneal large copper and brass sheets and keep them flat. The same method is used for aluminum and monel sheets. After being heated the sheets are laid between dry pine boards and left to cool. The boards are excellent heat-insulators and as the wood chars and smolders for a time the slow combustion helps to maintain the heat. The sheets cool very slowly and when finally cool will be found soft and easily bent.

Scraps from The Foundry Scrap Pile

A. E. Cambridge, who, for the last year, has been in the employ of the E. J. Woodison Company as engineering expert, has gone to Montreal to take charge of the new office and storeroom, which the Woodison Co. recently opened in that city.

H. J. Wilson, who is probably the pioneer of automobile foundry work in Canada, has severed his connection with the General Motors Corporation and has taken charge of the foundry division of the Hiram Walker and Sons, Metal Products, Limited, Walkerville, Ont.

The James Morrison Brass Foundry, at 93 Adelaide St., West, Toronto, was visited by fire on Nov. 2nd., which did damage to the extent of about one hundred dollars. The delay to the work was slight, and the damages were soon repaired.

The Aylmer Pump and Scale Works, Aylmer, Ont., has been purchased by Mr. Heard, President of "Spramotor" and other industries in London and St. Thomas. An inventory of the stock is being taken, after which it will be decided what part this concern will play in the production of the various lines manufactured by the Heard interests.

Fatality at foundry fire: The Japanning department of the Taylor-Forbes works, Guelph, Ont., was destroyed by fire on Saturday, November 5th, and one workman James R. Smith lost his life. He was sixty years of age and when found by the firemen he was unconscious, being badly burned about the face, shoulders and arms. He had also breathed the poisonous fumes and smoke. He was rushed to the hospital where everything was done to save his life, but his injuries were beyond human aid and he succumbed the following morning.

Statuary business brisk. The Architectural Bronze and Iron Works department of the Canadian Allis-Chalmers Co., Toronto, have been so rushed with orders for bronze statuary that additional help had to be secured in order to have the orders filled on time. Help of this kind is not easily secured, but a sufficient staff is now installed and the department is running full time. The war created a demand for memorial tablets and statuary which had not hitherto been very great and which had formerly been to a considerable extent imported. The French process is followed, which calls for a solid plaster pattern around which the mold is built, the core being made in the mold and the thickness scraped from the core.

The Canadian Austin Machinery, Ltd., Woodstock, Ontario, Canada, has been incorporated under the laws of Canada to act as sole manufacturer and distributor in Canada of the complete line of earth-moving , and concrete-mixing machinery handled by the Austin Machinery Corp., New York.

R. Micks Esq; formerly metallurgical inspector of projectiles for the United States Munition Board, during the war, has taken the position of foundry foreman with the Canadian Allis-Chalmers Company in their former pipe foundry which has recently been remodelled for the production of small and medium sized electric motors, transformers, etc.

A Canadian Chamber of Commerce has been formed in London, England, with the object of promoting trade between the Dominion and the mother country. The council is composed of representatives from each of the provinces in the Dominion together with representatives of various Canadian business interests. The acting secretary is Mr. R. B. Stewart, in care of Beatty Brothers, 55 Holborn Viaduct, E. C., 1, London, England.

The Ontario Foundry Co., 36 Pearl Street, Toronto, suffered a loss of five hundred dollars through fire which destroyed their cupola house on, Oct. 19th. The shafting and blower were put out of commission, this delaying work for some time, otherwise the foundry was not damaged. A new fireproof building is being built and the plant will soon be in operation again. Two firemen had narrow escapes.

Miniature Copy of Catalogue F. is being distributed by Young Brothers Company, of Detriot. It is a facsimile of their Industrial Oven catalogue, but got up in miniature to give an idea of what the real catalogue contains. It is quite complete, gives much data and shows many oven types, which are used for various purposes, including that of drying cores and molds. The small copy is sufficient to create interest and on request the full-sized catalogue will be sent.

The Gurney Foundry Company are making considerable improvements to the Queen Street works, Toronto, a permit for eighteen thousand dollars' worth of improvements having been taken out on October 1.

The Hamilton Gas Mantle Co., Hamilton, Ont., have recently added an up-to-date electro plating department to their plant, and will do nickle, silver and copper plating, galvanizing, oxidizing and lacquering. Among the new lines which they are producing are a line of ash trays and some silver plated table specialties.

The Goldstein Mfg. Co., Toronto, is erecting a new plant at Nos. 12 and 18 Beverley St. This will give them additional space and enable them to take care of the new business into which they have gone quite recently, which is the manufacture of copper and brass tubes, seamless drawn. They state that at present this is the only Canadian mill in operation turning out this product.

Whiting Cranes, is the title of number 158 Catalog just published by the Whiting Corporation of Harvey, Ill, to supersede their number 151. The book describes and illustrates their standard crane designs, and contains several tables of standard-clearances, which should be of value to engineers. The illustrations include the details of the crane as well as the different designs of complete cranes. Other illustrations show the cranes in operation in different lines of work for which they are adapted. together with the names of the companies who own the plants. The catalog is for free distribution.

The Detroit Seamless Steel Tubes Co., of Detroit, Mich., for over twenty years manufacturers of seamless steel tubing, have again found it necessary, since occupying their new modern plant to increase their sales staff.

The position newly created is that of assistant general manager of sales, and Mr. C. C. Rosser, the head of the department, has announced the appointment of Mr. C. H. Hobbs for this important position. For over fourteen years Mr. Hobbs has been with the Lackawanna Steel Company and for the last five years been the District Representative in charge of the Detroit office.

OBITUARY

The death of Senator Frederic Nicholls which occurred on October 25 removes one of Canada's leading citizens. Senator Nicholls was interested in many enterprises, and was, until a few months ago President of the Canadian General Electric Co. and of the Canada Foundry Co. He was born in England in 1856 and came to Canada in 1874. He lived for a short time in Montreal and also in Ottawa, but spent most of his life in Toronto, where he first followed newspaper work, after which he became secretary of the Canadian Manufacturers Association and later was instrumental in starting the publication of the "Canadian Manufacturer," a perodical which was the organ of the Manufacturers' Assn. One move brought on another and after managing the "Canadian Manufacturer" until 1893 he decided to become a manufacturer himself and with others, organized the Canadian General Electric Company with which he remained until the present year, when he retired. A short sickness carried him off.

JOHN M. GILL

John M. Gill, for many years president and general manager of the James Smart Manufacturing Co., Brockville, Ont., died at his home in that town on September 27th. Mr. Gill was born in Montreal, but had lived most of his life in Brockville, having gone there in the year 1867. For some time he was engaged in business with his brother, but fire destroyed their plant in 1882, after which he entered the James Smart Manufacturing Co., where he remained until it was taken over by the Canada Foundries and Forgings.

Mr. Gill was a member of the Canadian Mfrs. Assn. and of the Brockville Board of Trade, and was a Liberal in politics. He was 73 years of age.

FRED A. HARLEY

Fred A. Harley, president of the Harley-Kay Company, of Georgetown, died in that town on October 8th at the early age of 45 years. Mr. Harley was born in Georgetown and spent his entire life there, where he learned the machinist trade. About fifteen years ago he started in business and manufactured an automatic knitting machine which he had perfected. The knitting machines were well known throughout Canada, and were also being exported, only a few weeks ago a large contract being signed for export to New Zealand.

AN ARABIAN PROVERB

He who knows and knows not that he knows, is asleep. Awaken him.

He who knows not, and knows that he knows not, is simple. Teach him.

He who knows not, and knows not that he knows not, is a fool. Shun him.

He who knows, and knows that he knows, is wise. Follow him unto the end.

TRADE CONDITIONS QUIET THIS WEEK NO CHANGE IN PRICES HAS OCCURRED

GENERAL trade conditions for the past week have not been very encouraging, although the amount of business moving is still a distinct improvement over that which averaged over the first six months of the calendar year. Still the trade cannot refrain from comparing the present volume with that of the somewhat better conditions existing during the month of September and the first half of October. Taking all matters into consideration, conditions are far from being in bad shape. After practically a year of quiet business conditions, the country has gradually liquidated its stocks of iron and steel and, it is the exception rather than the rule, to find the manufacturer or jobber with any large stock of materials, either raw or manufactured, on hand. Production in the various lines is about equal to the consumption, which is a rather healthy condition from an economic standpoint, although it works out as a hardship to many who must necessarily be among the unemployed. Some rumors have been present that there was a general shortage of galvanized sheets. This condition is not significant as stocks were short all along the line from mill to consumer and the seasonable autumn demand has been a heavy drain upon these small stocks. The condition will automatically adjust itself in a short time. The seasonable autumn demand has about spent itself. Building operations, generally speaking, are slowing down and everything points to a settling down for winter conditions.

Production of Steel

Production of steel continues to fluctuate between two limiting points, not far separated from one another. The total production and total consumption are, roughly speaking, about the same. Prices are not changing to any great extent. The present quotations leave only a small margin for the producer and are not likely to be cut to any extent. For some time past there has been a tendency toward stiffening in price, but practically no changes of any moment have been made. Present low prices have been made to stimulate business that might be slow in closing, and thus represent the point, beyond which the steel producer will not go, as it would be a losing proposition.

The recent rail orders are being rushed out and will be completed, in all probability, before the end of the year. Bars continue to be very quiet. Structural shapes are also rather quieter than they have been. Plates are only moving slowly. Sheets are moving in fair quantities. The week just past has not produced any individually large orders and the general volume of business is much the same as last week.

Pig Iron

The foundries have not come into the market for pig, to any great extent, the last week. Prices have not changed. If any increased demand for pig iron becomes evident the present limited supply will soon become exhausted and cause an increase in quotations. It is not likely that additional furnaces will "blow in" until there is more attraction in the margin of profit. This condition apparently was understood by the local foundries and the increase in business in September was, to a certain extent, speculative. To-day the small supply carried by foundries is considered ample. Of late the foundrymen making enquiries for quotations, which are made "f.o.b. furnaces, freight allowed to destination" seems to be of the opinion that freight rates are to be reduced, hence are asking to be protected against falling rates. This plainly shows that these inquiries are for stock and not likely to be used immediately. Some time ago several steel plants in the United States broke into the pig iron market and upset the prices. Following this the price was raised on two or three occasions to the present level and nothing further in this connection is expected as these furnaces have evidently disposed of their surplus pig at the low level and are not looking for further business.

Lead base babbitt metal is the title of a publication which is being distributed by the Westinghouse Electric & Manufacturing Co., announcing the placing on the market of lead base babbitt metal. This metal is the result of many years' use of this material by Westinghouse, approximately 1,000,000 lbs. of lead base babbitt metal being used during 1920. The subjects discussed in this publication are overheating, bearing design, preliminary machining of shells, cleaning of shells, care of tinning alloy, tinning of bronze shells, tinning of pipe and malleable iron bearing shells, anchor holes in case iron bearing shells, care of the babbitted metal cleaning solutions and materials. This is known as Folder 4474.

A. S. Capwell, manager Canadian Buffalo Forge Co., Kitchener, has returned from a business trip to the Maritime Provinces. He states that he has seen periods of greater business activity than at present down by the sea, but reports some improvement in the demand for lumber. The New England States is the best and most convenient market for this and the movement noted will benefit lumbermen to a greater extent than by mere reduction of stocks. So much money is tied up in lumber that banks have been reticent about advancements for next season's operations. A more active market should relieve the money situation. Coming westward, Mr. Capwell noted that building operations became increasingly evident—an encouraging sign to one hopefully observant of any conditions making for improved business.

Making Castings in Permanent Molds or Dies

The Process Is Most Adaptable to Alloys of Comparatively Low Fusing Points Such as Zinc, Tin, Lead and Aluminum

By CHARLES PACK

THE SUBJECT of die casting is one which should be studied with interest since it is one which is probably older than that of real molding. If it were not for the shrinkage in cast iron it would be quite possible to successfully cast various complicated pieces in permanent molds, but since this is not possible it is well to see how near we can come to it. Car wheels are cast in molds which are partially permanent, but this is easily accomplished on account of the metal shrinking away from the chill. However the casting of iron in metallic molds can not be considered a success even in a slight degree, and the same may be said of brass. Recently we had the question asked "Is there any kind of metal from which to make molds into which we can pour melted brass without having it stick to the mold after the first two or three castings are made." I felt confident that there was not but I did not wish to commit myself without first getting other views so I published the question. I got no favorable replies, so have concluded that no one has yet found such a material. There are however other alloys which can be successfully made in dies and which can be used to good advantage in their proper place. What is now known as die casting must not be confused with pouring metal into an ordinary mold, made of metal or some other substantial material. Die casting is a process where the mold is made of metal and finished with such accuracy as to produce a perfect casting requiring no machine work to be done upon it, and instead of pouring the metal from a ladle it is forced into the die under considerable pressure. Some of the devices for die casting are covered by patents but the principle is as old as the patent office. The object of the pressure is to force the metal into every detail of the mold and also to some extent to prevent shrinkage. Everyone knows how difficult it is to get aluminum castings to come sound. This is because it has not sufficient weight to lie against the mold. The least bit of moisture in a sand mold will creat steam enough to force the melted aluminum away from the face of the mold. A heavy riser has not sufficient weight to feed an aluminum casting and prevent it from shrinking, but this can be overcome by a simple device. Take a smooth bored pump cylinder and use it for a riser, and have it fitted with a piston with several pounds of weight to it. As soon as poured place the weighted piston on top of the metal in the riser. If the riser is heavy enough to remain fluid while the castings congeal, the weight will force the melted metal into it in a similar manner to how an iron riser will feed from its own weight. But to get back to die-castings. Any one who has ever visited a foundry or watched a linotype machine in operation will have a fair idea of the principle. The following paper by Mr. Charles Pack of Doeler Die Casting Co., Brooklyn, N.Y., which was presented at the spring meeting, St. Louis, M.O. May 1920, of the American Society of Mechanical Engineers 29 West 39th Street, New York, will be of interest.—Editor.

Die Castings

Die castings may be defined as castings made by forcing molten metal, under pressure, into a metallic mold or die. It is erroneous to assume that all die castings have similar properties, since it is apparent that the properties of the die casting will depend upon the nature of the alloy used. The die-casting process is best adapted to alloys of comparatively low fusing points which may, for convenience, be divided into the following groups:

Group A—Zinc Alloys, consisting essentially of zinc alloyed with tin, copper or aluminum.

Group B—Tin Alloys, consisting of tin alloyed with copper, lead, or antimony.

Group C—Lead Alloys, consisting essentially of lead alloyed with tin or antimony.

Group D—Aluminum Alloys, consisting essentially of aluminum alloyed with copper.

2. No general rules can be laid down governing the design and application of die castings since the art depends largely upon the skill of the designers, and quite frequently a part may be considered as impractical from a die-casting standpoint which, if measured by given standards, may be redesigned and die-cast very successfully.

Nevertheless, the writer will endeavor to outline briefly the general properties of the alloys used, their fields of application and their limitations.

Group A—Zinc Alloys

3. Typical Alloy. A typical zinc alloy for die castings is that whose composition is given below, together with particulars regarding its general properties and the casting limts which must be observed.

Zinc, 87.5 per cent; Tin, 8.0 per cent; Copper, 4.0 per cent; Aluminum, 0.5 per cent.

Properties

Color ....Silver white
Weight per cu. in.....0.253 lb.
Melting point ....780 deg. Fahr.
Initial fusing point ...275 deg. Fahr.
Tensile strength.16,160 lb. per sq. in.
Elongation .. ..2 per cent
Compressive strength .....27,670 lb.
Pressure required to shorten bar 1 in. diameter .....10 per cent
Hardness number (Brinell) 64.6

Casting Limits

Maximum weight for casting ...8 lb.
Minimum limit of wall thickness .. ..1-10 in.
Small castings ....1-16 in.
Variations from drawing dimensions per inch of diameter or length .. ..0.001 in.
Cast Threads (minimum number):—
External ....24 per inch
Internal ..depends on conditions, often cast
Cast Hole: minimum diameter 0.031 in. (Depends largely upon the depth and thickness of casting)

Draft: Cores, 0.001 in. per inch of length or diameter. Side walls, 0,001 in. per inch of length.

4. General Design. Sections of castings should be as uniform as possible. Sharp corners should be avoided and fillets added wherever permissible. Undercuts in castings should be avoided wherever possible.

5. General Remarks. Alloys of this type are corroded by any alkaline or aqueous solutions of any salts. Castings may be polished to a high luster, but soon tarnish when exposed to ordinary atmospheric conditions. Castings made from this alloy may be readily plated with nickel, copper, brass, silver, or gold. When properly plated such castings will retain their luster as well as those made from brass or bronze.

6. Applications. Castings made from this alloy should not be used for parts that are subjected to severe stress or sudden shock in service. They are used extensively for parts of phonographs, calculating machines, drinking-cups, cigar, candy, stamp and gum vending machines, magneto housings, automobile body trimmings, pencil-sharpening machines, time-recording devices, stamp-affixing machines, and for many other devices of a kindred nature.

Group B—Tin Alloys

7. Typical Alloy. The five compositions given below are typical die-casting alloys of the tin group:

	Tin	Copper	Lead	Antimony
No. 5 .. ..61.5	3	25	10.5	
	p. c.	p. c.	p. c.	p.c.
No. 1 90	4.5	0	5.5	
No. 2 86	6	0	8	
No. 3 84	7	0	9	
No. 4 80	0	10	10	

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8. Alloy No. 1 is a so-called "genuine babbitt" metal and was used very extensively during the war for main-shaft and connecting-rod bearings on all American-made aeroplanes and motor trucks. No. 2 is somewhat harder than is used extensively for bearings in internal-combustion engines. No. 3 is somewhat harder than alloy No. 2 and is the S. A. E. standard for high-grade internal-combustion-engine bearings. No. 4 is in general use for light bearings on stationary motors. No. 5 is a bearing metal for light duty and is used on a large number of moderate-priced automobiles for mainshaft and connecting-rod bearings.

General Properties:

9. In addition to the five compositions mentioned, hundreds of similar alloys may be made having various specific properties. A study of these alloys, however, would prolong this paper unduly, and in the opinion of the writer, is beyond its scope. The die-casting process, it may be said, is applicable to any one of the alloys of this group and it may be left with the engineer to specify the alloy best suited to his requirements.

Maximum fusing point 450 deg. Fahr.
Weight per cu. in.....
depends on lead content

Casting Limits:

Maximum weight for casting ...10 lb.
Limit in wall thickness .... ..1-32 in.
Variations from drawing dimension per inch of diameter or length .....
....0.0005 in.
Cast Threads, minimum number:—
External ....'.....27 per inch
Internal .....depends on conditions, often cast.
Cast Holes: minimum diameter 0.031 in.
(Depends on depth and thickness of casting).

Draft: Cores, 0.0005 in. per inch of length and diameter. Side walls, 0.001 in. per inch of length.

10. Applications. Tin alloys find their largest field of application in their use as bearings for internal-combustion engines. They are also used for parts of soda fountains, cream separators, milking machines, surgical apparatus, galvanometer's parts, player pianos, etc, where a tensile strength of over 8000 lb. per sq. in. is not essential and where resistance to corrosion is of importance. They are not affected by water, weak acid, or alkaline solutions, and when free from lead, are extensively used for food-container parts.

Group C—Lead Alloys

11. Typical Alloys. The following four compositions are those of lead alloys widely used in the production of die castings:

	Lead	Tin	Antimony
	p.c	p.c.	p.c.
No. 1 83		0	17
No. 2 90		0	10
No. 3 80		10	10
No. 4 80		5	15

General Properties

Weight per cu. in ....depends on lead content.
Maximum fusing point ..600 deg. Fahr.

Casting Limits:

Maximum weight for casting ...15 lb.
Minimum wall thickness .. ..1-32 in.
Variation from drawing dimensions per inch of diameter or length .....
....0.001 in.
Cast Threads, minimum number:
External ....24 per inch
Internal .....depends on conditions, often cast.
Cast Holes: minimum dia. ...0.031 in.
(Depends on depth and thickness of casting).
Draft: Cores, 0.005 in. per inch of length and diameter. Side wall 0,001 in. per inch.

12. Alloy No. 1 is generally known as C. T. (Coffin Trimming) metal, due to its extensive use in the manufacture of coffin trimmings. This alloy is also a good bearing metal for light duty and is employed for thrust washers and camshaft bearings on light internal-combustion engines. No. 2 is somewhat softer and more ductile than No. 1. No. 3 is much used for light bearing duty, being somewhat tougher and stronger than Nos. 1 and 2. No. 4 is somewhat harder than No. 3 but less ductile. Many similar alloys may be compounded, all of which may be die-cast readily.

13. Applications. Lead alloys may be used where a metal of non-corrosive properties is desired and where a tensile strength of not over 8000 lb. per sq. in. will suffice. They are used extensively for fire-extinguisher parts, low-pressure bearings, ornamental metalware, and many parts that come in contact with corrosive chemicals. They should not be used for parts that may come in contact with foods or that may be handled often in service, since the poisonous properties of lead and lead alloy are well known.

14. The main advantage of these alloys lies in their comparatively low cost, but their high specific gravity must be considered, some lead alloys having a specific gravity double that of the zinc alloys.

15. During the war lead alloys were used for all hand-grenade fuse parts and many millions of these parts were made. Lead alloy die castings were also used for thermite grenades, offensive grenades, trench-mortar fuse plugs and many other parts where non-corrosiveness was an essential requirement.

Group D—Aluminum Alloys

16. Typical Alloy. A typical aluminum alloy for use in die-casting work has the following composition:

Aluminum, 92 per cent; Copper 8 p.c.

Properties

color .....Silver White
Weight per cu. in .. ..0.115 lb.
Melting point .. ..1150 deg. Fahr.
Tensile strength ..21,00 lb. per sq. in.
Elongation .. ..1.5 per cent
Hardness number (Brinell) 60.5

Casting Limits

Maximum weight for castings ..5 lb.
Minimum wall thickness .....1-16 in.
Variation from drawing dimensions per inch of diameter or length 0,0025 in.
Cast Threads, minimum number:
External .. ..20 per inch
Threads are cast oversize 0.01 in. to be chased to size.
Internal threads rarely cast.
Cast Holes: Minimum diameter 0,093 in. and not deeper than 1 in. Larger cores may be cast much deeper; smaller holes may be spotted to facilitate drilling.
Draft: Cores 0,015 in. per inch of diameter or length. Side walls, 0,005 in. Cores of less than ¼ in. diameter to have 0,005 in. draft per in. of length and diameter.

17. The composition described above is well known in the arts as No. 12 alloy and is used very extensively for automobile and aeroplane parts. By varying the copper content harder or softer alloys may be obtained, all of which may be die-cast successfully.

18. Applications. Aluminum die castings find wide employment in the manufacture of parts of automobiles, such as spark and throttle control sets, magneto parts, battery ignition and lighting systems, speedometers, etc. They are also used for parts of vacuum sweepers, phonographs, milking machines, vending machines, etc.

Brass and Bronze Die Castings

19. Die castings made from various types of brasses and bronzes were put on the market as early as 1910, but have nexer been successful commercially. At the present time there is only one die-casting manufacturer producing brass die castings in any appreciable quantity.

20. It is a comparatively simple matter to produce a small quantity of sample brass die castings, but no material has yet been found for die-making purposes, which will withstand the continuous action of molten brass and at the same time retain its shape, surface and size. The die casting of brass and bronze must be considered as in the experimental stage at the present time, with little or no immediate prospect of the solution of the problem.

Developments Due to the War

21. The most important development in the art of die casting during the war was the perfection of the process of die casting aluminum and its alloys. Prior to 1914 all die castings were made from zinc, tin, or lead alloys. The die casting of aluminum was in the experimental stage and no aluminum die castings had been produced commercially at that time. In making this statement the writer is aware of the fact that many aluminum pistons and similar parts had been cast in metallic molds. These castings, however, were poured by gravity and were comparatively crude. No attempt was made to cast small holes,

(Continued on page 46)

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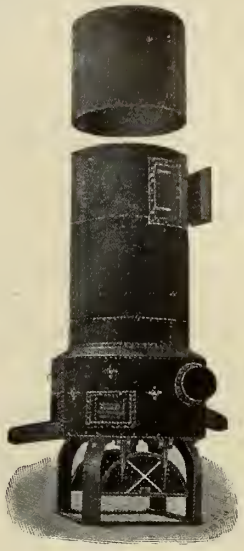

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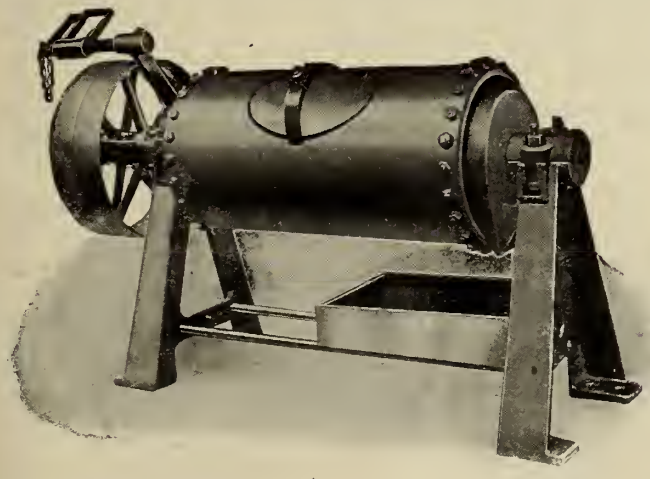

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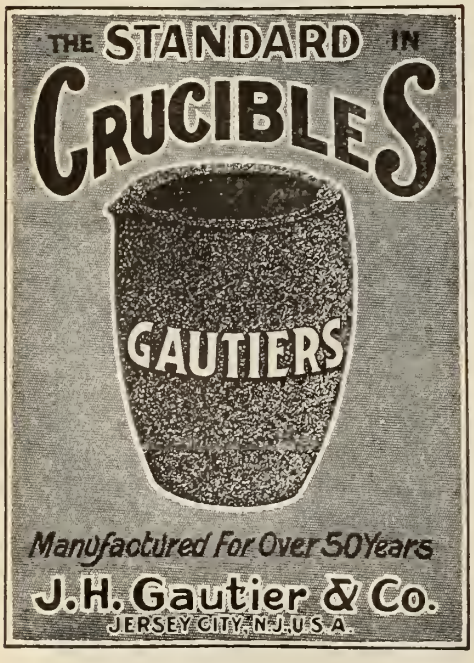

MAKING PATTERNS FOR STATUARY

The making of patterns for statuary or any ornamental designs is a process quite different from that of ordinary wood pattern making. There may be different ways of accomplishing this, the same as anything else but the way that it is proposed to describe in this article is that of modelling it in potters' clay. Good clean clay should be secured, and if it is not perfectly clean it should be dried and pulverized, after which it can be sifted and all lumps removed. The dust is then wetted and allowed to soak for a few hours when it is kneaded and tempered into the consistency of dough. In this condition any person with artistic ability can model it into any shape desired. It will keep getting hard, which will be found to be an advantage as it will make it more secure and easier to keep in shape. The part which is being worked can easily be moistened with a wet sponge. In shaping the clay it is not necessary to go into all the details of the design, so long as sufficient material is left to work on. After it is brought to approximately the proper shape it is placed in a frame and Plaster of Paris poured around it. A parting is made where it will most conveniently part. This parting will be oiled which prevents the next plaster from adhering to it. Another frame is put on and the other half poured with plaster. This makes a two part mold. When these set, they will be stronger than the clay and can be easily parted, although the clay model will likely be destroyed. After digging out all of the clay the plaster molds are washed clean with water and after being partially dried they should be well oiled. A gate is cut on the joint at any convenient place and after clamping the halves together a plaster cast is made in this mold. We now have a plaster mold containing a plaster cast, and we must remove the mold, even though we have to destroy it, in which case care must be taken to not damage the cast. After the cast is free from the mold we are ready to begin on our real pattern. Sharp chisels and cutting tools of proper shape are used and the plaster is cut to the exact design in every detail. Plaster of Paris works easily, although it sets firm, and holds a sharp corner if a reasonable amount of care is exercised. After completing the work of putting it into shape, it is well varnished with shellac varnish when it will be ready for the molder.

MAKING CASTINGS IN PERMANENT MODELS OR DIES

Continued from page 44

slots or threads or to work with any such degree of accuracy as that found in modern pressure die castings.

22. The first commercial aluminum die castings appeared on the market in 1914 and during the war a suitable steel was developed for making the dies for this process that would withstand the action of molten aluminum without cracking, a problem the solution of which was essential to the development of the industry.

23. The part that this development played in the winning of the war will be readily appreciated when it is stated that at the cessation of hostilities there were being produced about one million aluminum die castings daily in this country for parts of gas masks, machine guns, aeroplanes, motor trucks, motor ambulances, surgical instruments, canteens, field binoculars, and many other appliances of war.

Comparative Cost of Die Casting

24. The cost of die castings cannot be computed on the pound basis since it depends on the design of the piece, the number and position of the cores, the quantity to be produced and certain other factors. For comparative purposes it may be stated that at the present time tin alloy castings are the highest in cost, being followed by those of aluminum alloy, zinc alloy and lead alloy in the order named.

25. In considering the use of die castings it is well to bear in mind that on a pound basis die castings are far more expensive than iron sand castings where the machining cost is not considered. As the zinc alloys whose properties are similar to cast iron, cost from $200 to $275 per ton in ingot form, it is apparent that the substitution of a die casting for an iron casting can only be considered when the machining cost is sufficient to compensate for the difference in cost of the raw materials.

In the next issue of Canadian Foundryman we will publish an interesting article on the making of aluminum castings.

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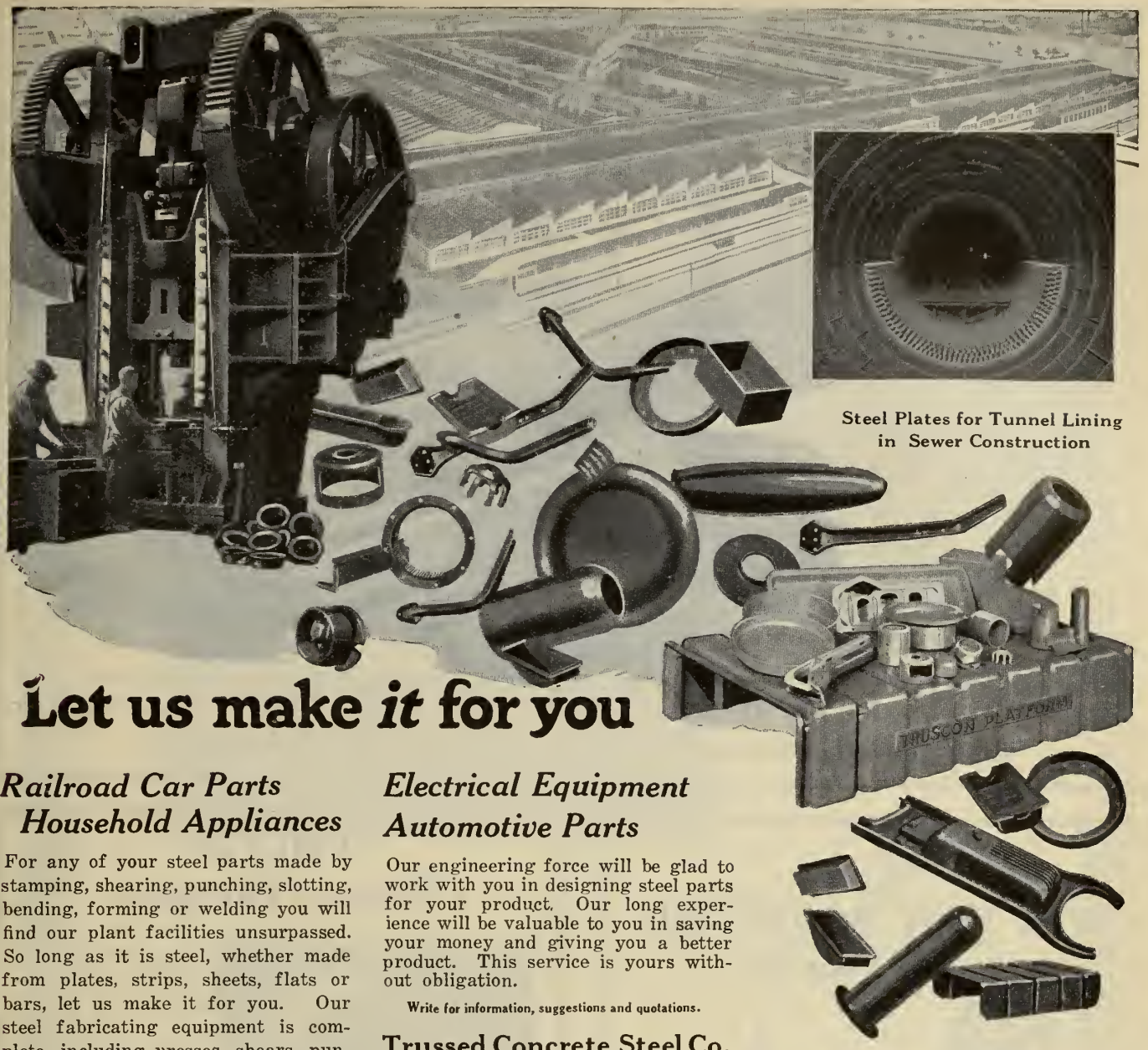

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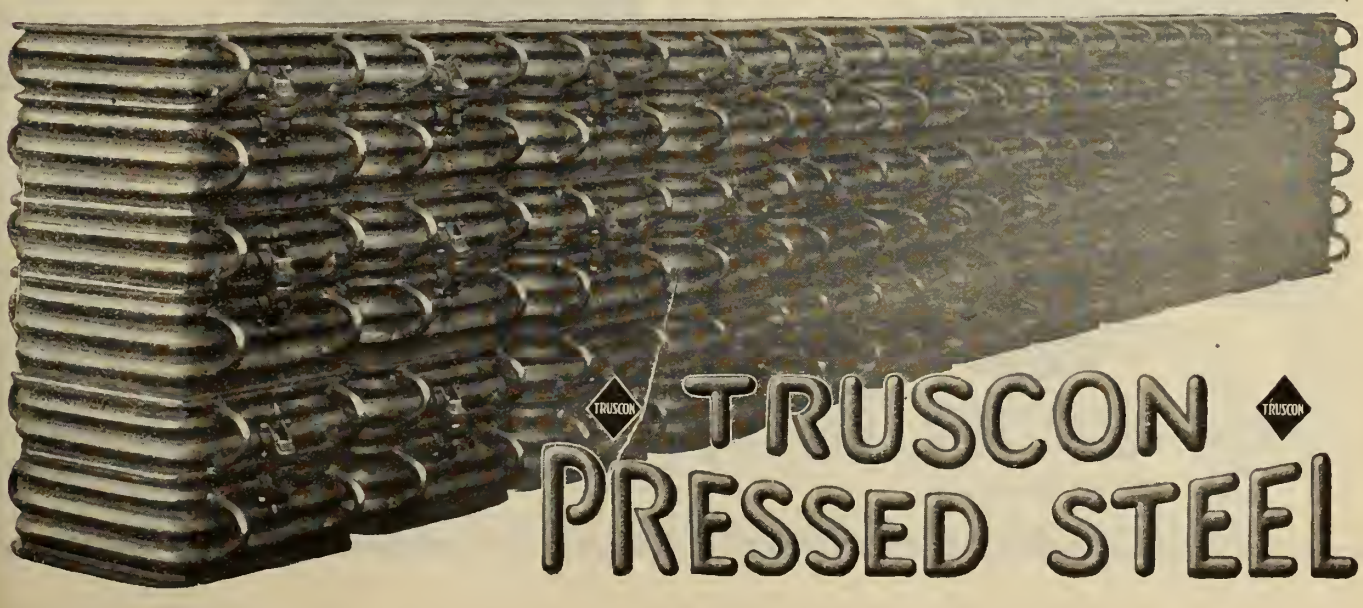

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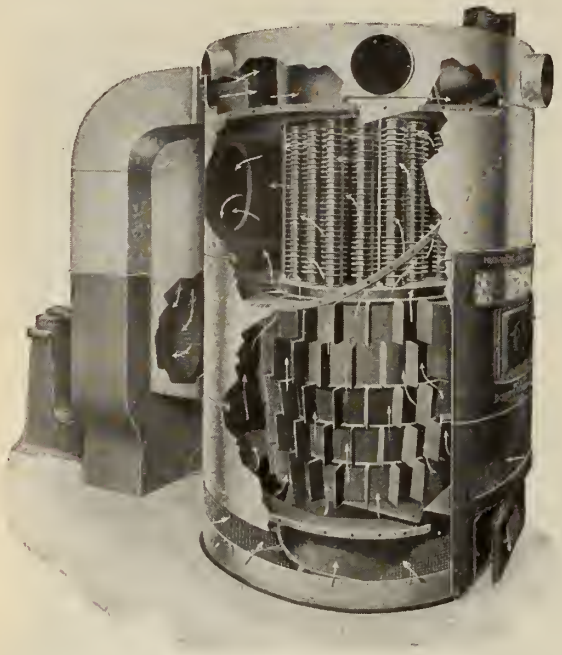

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By direct application of the air to the heating chambers and forced circulation of the warm air by the use of a multi-vane fan, eliminates all losses in other systems incident to conversion transmission.

Eliminates steam plants in industries purchasing electric power from public utilities; also industries using internal combustion engines.

Capacity to heat 100,000 cu. ft. to 500,000 cu. ft. with one unit.

A postal to our nearest office will bring details.

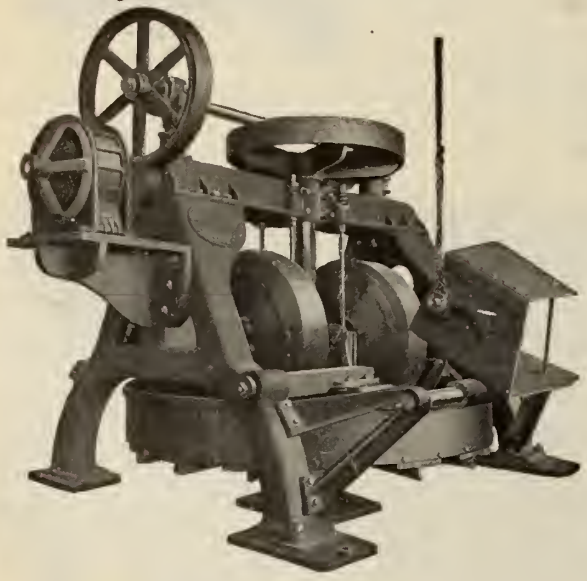
858 Dupont St. Toronto, Ont. **THE E. J. WOODISON CO. LIMITED** 261 Wellington St. Montreal, Que.

Manufacturers in Canada of the Robt. Gordon Mechanical Hot Blast Heater

FROST

Wet Pan Sand Mill

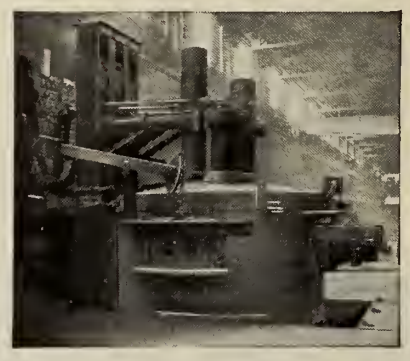
for Steel Foundries



The FROST Mfg. Co.

112 W. Adams St.

"VOLTA" Electric Furnaces



Steel Furnace

Brass Furnace

Steel Furnaces 100 lbs. to 15 tons capacity.

Grey Iron and Ferro-Alloy Furnaces. In sizes to suit customer.

Brass Furnaces Three - Phase, in standard sizes of ⅛, ¼, ½ and 1 ton capacity.

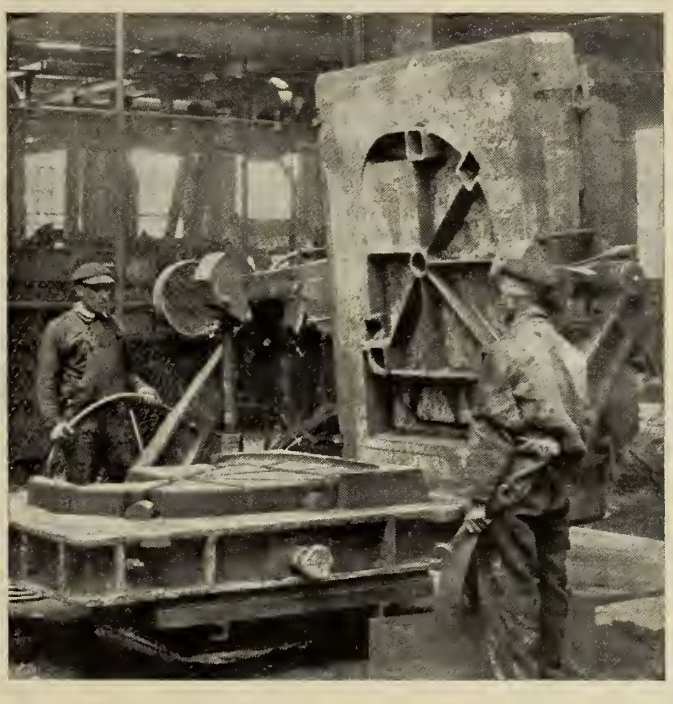
Electric Furnace Accessories of all kinds.

Estimates and General Information cheerfully given.

The Volta Manufacturing Company, Ltd.

WELLAND, ONT.

If It's A Herman It's Worth Using, It Made It's Way by the Way it's Made



Use this Machine to Reduce Your Labor Costs

ABOUT a 50% cost reduction on average jobs would be a safe estimate where molding is hand superseded by machine methods. Beyond this it depends on **the kind of machine you use.**

A wise plan then, is to use the best so long as the price is not exorbitant. By using any other you are losing efficiency.

Foundrymen who have used a Herman Jarr Independent Rollover and Pattern Drawing Molding Machine invariably consider it the worthy choice of any foundry.

Let our Service Department help you determine your molding machine requirements.

Herman Pneumatic Machine Company
GENERAL OFFICES: Union Bank Building, PITTSBURG, PA.
MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U. S. A.
Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London, S. W., Eng.

Cuts Cleaning Costs

The Effective Enduring Abrasive

It's the impact in blasting that does the work. Sand under impact crushes quickly and pulverizes to dust. It must be replaced by new sand frequently. Globe Chilled Shot can be used 250 to 275 times before it becomes ineffective. It reduces storage bins; eliminates sand driers; reduces labor costs.

Send for samples.

GLOBE

CHILLED SHOT

It gives you a better and quicker Blasting Job at a reduced cost.

THE GLOBE STEEL COMPANY, Mansfield, Ohio, U.S.A.

In Canada: Canadian Johns-Manville Company, Asbestos, P.Q.

TABOR
3-inch Plain Jarring Machine For Small Molds And Medium Sized Cores

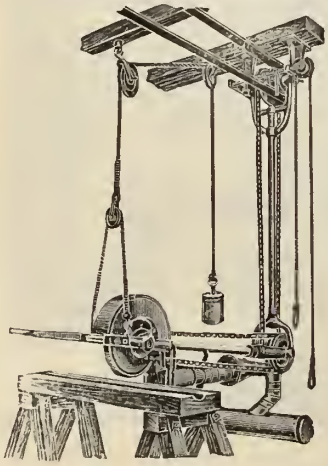
3" Tabor Jarring Machine with 12" x 14" Table

A Necessity in Every Foundry

SEND FOR BULLETIN M-J-P

THE TABOR MFG. COMPANY

6225 State Road, Tacony, Philadelphia, U.S.A.



Use Swing Grinders

and bring the wheel to the work.

For grinding Iron or Steel Castings, Steel Ingots, Billets and Bars, Rails, Steam-hammer Pallets, Plough Plates, Welded Work etc.

A light but powerful Machine, the result of many years' experience. Roller bearings throughout and V linked belting eliminate friction. Takes any size wheel from 12 in. x 1 1-4 in. to 16 in. x 4 in. without alteration.

The DOMINION FOUNDRY SUPPLY CO. Ltd., MONTREAL, will show you one of these machines and quote prices.

A. W. Sainsbury, Ltd., Sheffield, England

Telegrams "Sainsbury, Sheffield". Marconi Code.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

If what you want is not listed here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

ANOOES, BRASS, COPPER, NICKEL ANO ZINC
W W. Wells, Toronto, Ont.

ARGGON
Dominion Oxygen Co., Toronto, Ont.

BENCH RAMMERS
I. Johnson & Son, Ltd., Toronto.

BLAST GAUGES
Clark Blast Meter Co , Gladbrook, Iowa.

BRASS FURNACES
Down Shaft Furnace Co., Easton, Pa.

CHEMISTS
Charles C. Kawin, Chicago, Ill.

CLAMPS, FLASK
Diamond Clamp & Flask Co , Richmond, Indiana

CORE BINDERS
Scarfe & Co., Ltd., Brantford, Ont.

CORE COMPOUNDS
Scarfe & Co., Ltd., Brantford, Ont.

CORE MACHINES
American Foundry Equipment Co., New York City.

CORE OILS
Scarfe & Co., Ltd., Brantford, Ont.

CORE OVENS
Damp Bros., Mfg. Co., Toronto, Ontario.
Monarch Engineering Mfg. Co., Baltimore, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.

CORE PLATES
Damp Bros., Mfg. Co., Toronto, Ont.

CORE SANO
Brockville Molding Sand Co., Brockville, Ontario.
Benson & Patterson, Stamford, Ont.
George F. Pettinos, Philadelphia, Pa.

CRANES
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CRUCIBLES
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J. H. Gautier & Co, Jersey City, N. Y.

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ENAMEL WARE
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A. C. Leslie & Co., Ltd., Montreal, Quebec.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Quebec.

FIRE BRICK
Bailey & Bell Firebrick Co., Toronto, Ont.

FLASKS
I. Johnson & Son, Ltd., Toronto.

FLASKS, SNAP
American Foundry Equipment Co., New York City.

Directory of Foundry Supply Houses

The Buyers' Directory of Canadian Foundryman was originally intended to contain information regarding lines in the production of which the advertisers actually specialized. We now carry the advertising of leading supply houses, some of whom represent scores of manufacturers, in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the supply houses so we recommend that for all general requirements our subscribers communicate with the supply houses listed below:

The Dominion Foundry Supply Co., Limited, Montreal, Toronto and Winnipeg.

The Hamilton Facing Mill Co., Limited, Hamilton, Ont.

George W. Kyle & Co., Inc., New York, U. S. A.

Frederic B. Stevens, Windsor, Ont.

The E. J. Woodison Company, Limited, Toronto, Ontario, Montreal, Que.

FLASKS, STEEL
American Foundry Equipment Co., New York City.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Trussed Concrete Steel Co., Walkerville, Ont.

FOUNORY ENGINEERS
Charles C. Kawin, Chicago, Ill.
H M. Lane Co., Detroit, Mich.
McLain's System Inc., Milwaukee, Wis.

FURNACES, OIL
Hawley Down Draft Furnace, Easton, Pa.
Monarch Engineering Mfg. Co., Baltimore, Md.

FURNACES, GAS
Monarch Engineering Mfg. Co., Baltimore, Md.

FURNACES COKE
Monarch Engineering Mfg. Co., Baltimore, Md.

FURNACFS ELECTRIC
Volta Mfg. Co., Welland, Ont.

GRINOERS, PORTABLE
A W Sainsbury, Ltd.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.

GRINDERS, SWINGING
A.W Sainsbury Lt., Sheffield, England.

HEATERS
E. J. Woodison & Co., Toronto.

HEATING SUPPLIFS
Crane Limited, Montreal, Que.

HOSE COUPLINGS
Cleveland Pneumatic Tool Co., Cleveland, Ohio.

INDUSTRIAL ENGINEERS
H. M. Lane Co., Detroit, Mich.

KAOLIN
Whitehead Bros., Buffalo N. Y.

LADLES
Damp Bros., Mfg. Co., Toronto, Oot.

LADLE SHANKS
Damp Bros., Mfg. Co., Toronto, Ont.

MAGNETIC SEPARATORS
Dings Magnetic Separator Co., Milwaukee, Wis.

MALLETS
I. Johnson & Son, Ltd., Toronto.

METALLURGISTS
McLain's System Inc , Milwaukee, Wis.
Charles C. Kawin, Chicago, Ill.

METAL PATTERNS
Bryant Pattern Works, Windsor, Ont.
Hamilton Pattern Wks., Toronto, Ont.
I. Johnson & Son, Ltd., Toronto.

MOLOING MACHINES
American Foundry Equipment Co., New York City.
Benson & Patterson, Stamford, Ont.
Grimes Molding Machine Co , Detroit, Michigan.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Osborn Mfg. Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
W. H. Nicholls, Brooklyn, N. Y.

MOLOING SANOS
Whitehead Bros., Buffalo N. Y.
A. MacMillan, St. Catharines, Ont.
Benson & Patterson, Stamford, Ont.
Brockville Molding Sand Co., Brockville, Ontario.
Geo. F. Pettinos, Philadelphia, Pa.
Venango Sand Co., Franklyn, Pa.

OXYGEN
Dominion Oxygen Co., Toronto, Ont.

PATTERN MAKERS
Bryant Pattern Works, Windsor, Ont.
Hamilton Pattern Wks. Toronto, Ont
I. Johnson & Son, Ltd., Toronto.

PIG IRON
A. C. Leslie & Co., Ltd., Montreal,
Steel Co., of Canada, Hamilton, Ont.

PIPE FITTINGS
Crane Limited, Montreal, Que.

PLUMBING SUPPLIES
Crane Limited, Montreal, Que.

PNEUMATIC TOOLS
Cleveand Pneumatic Tool Co., Cleveland, Ohio.

RIDDLES
Great Western Mfg. Co., Leavenworth, Kansas.
The Preston Woodworking Machine Co., Preston, Ont.

SANO
Benson & Patterson, Stamford, Ont.
Brockville Molding Sand Co., Brockville, Ontario.
George F. Pettinos, Philadelphia, Pa.
Venango Sand Co., Franklyn, Pa.
Whitehead Bros., Buffalo N. Y.

SAND CUTTING MACHINES
American Foundry Equipment Co., New York City.

SANO MIXERS
Frost Mfg. Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.

SANO SIFTERS
Great Western Mfg. Co., Leavenworth, Kansas.
National Engineering Co.
The Preston Woodworking Machine Co., Preston, Ont.

SANO BLAST MACHINERY
American Foundry Equipment Co., New York City.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.

SANO MULLERS
Frost Mfg. Co., Chicago, Ill.
Nationa Engineering Co., Chicago, Ill

SAND BLAST ABRASIVES
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Globe Steel Company, Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND RAMMERS
Cleveand Pneumatic Tool Co., Cleveland, Ohio.

SANITARY EQUIPMENT
Crane Limited, Montreal, Que.

SNAP FLASKS
American Foundry Equipment Co., New York City.
Damp Bros., Mfg. Co., Toronto, Ont.
Diamond Clamp & Flask Co., Richmond, Indiana.
I. Johnson & Son, Ltd., Toronto.

SNAP FLASK JACKETS
Damp Bros., Mfg. Co., Toronto, Ont.

STEEL BANDS
Damp Bros., Mfg. Co., Toronto, Ont.

TUMBLING BARRELS
N. Slater Company, Hamilton, Ont.
R. MacDougall Co., Galt, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.

VALVES
Crane Limited, Montreal, Que.
Cleveand Pneumatic Tool Co., Cleveland, Ohio.

VENT WAX
United Compound Co., Buffalo, N. Y.

WASH ROOM FIXTURES
Crane Limited, Montreal, Que.

WELOING ANO CUTTING SUPPLIES
Dominion Oxygen Co., Toronto, Ont.

WHEEL BARROWS
Sterling Wheelbarrow Co., Milwaukee, Wis.

NO 7 SCARFE'S CORE OIL

The best substitute for higher priced Linseed Oil, -no longer time required- and it is cheaper to bake.

Scarfe's No. 7 is a good strong oil used in proportions—50 to 1—with lake washed sand; it has a breaking strength of 22 lbs. per square inch.

SPECIAL—Send us a sample of the sand you use. We will submit a core oil to give you better results.

SCARFE & COMPANY LIMITED

Makers of Industrial Varnishes and Paints for 44 years.

Head office: BRANTFORD, ONT. Branches: MONTREAL - WINNIPEG

How Do You Find Business?

Some one has said "BY GOING AFTER IT" and might have added "By offering what the customer wants."
Sand-Blasted castings will get the business because they are worth more to the customer.
For every plant there is a

PANGBORN — PANGBORN CORPORATION — ALL-WAYS SERVICE AND ALWAYS — HAGERSTOWN, MD.

HAGERSTOWN, Md. P. O. Box 8508

SAND-BLAST

That will cut your cleaning cost.

ANGULAR GRIT

SCIENTIFIC METALLIC BLASTING ABRASIVE

Trade Mark

Adopt metallic abrasive instead of sand. Angular Grit will reduce your costs — one hundred pounds of grit will outlast five tons of sand. It cleans faster, requires less handling and less storage space, and reduces dust 80%. Write for samples.

Pittsburgh Crushed Steel Co. Sole Manufacturers

PITTSBURGH, Pa., U.S.A., Established 1888

Canadian Representatives: WILLIAMS & WILSON, Ltd., Montreal, Canada

ANODES

Any style or shape
Quality Guaranteed

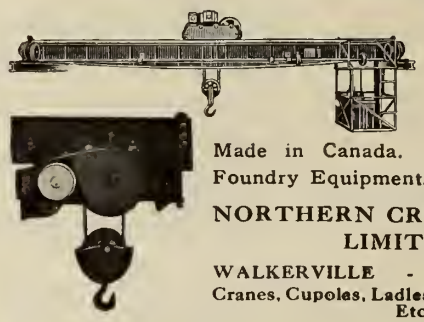
Why import your anodes when you can get guaranteed quality, quicker delivery, and can save duty and eliminate the annoyance of clearing at the customs by buying from us?

May we send you descriptive pamphlet and full particulars?

W. W. WELLS, Toronto

In Brass Bronze Copper Nickel Tin & Zinc

CRANES



Don't buy a crane or hoist without investigating Northern Products—Made in Canada. Also a line of Foundry Equipment.

NORTHERN CRANE WORKS LIMITED

WALKERVILLE - - ONTARIO

Cranes, Cupolas, Ladles, Hoists, Tumblers Etc.

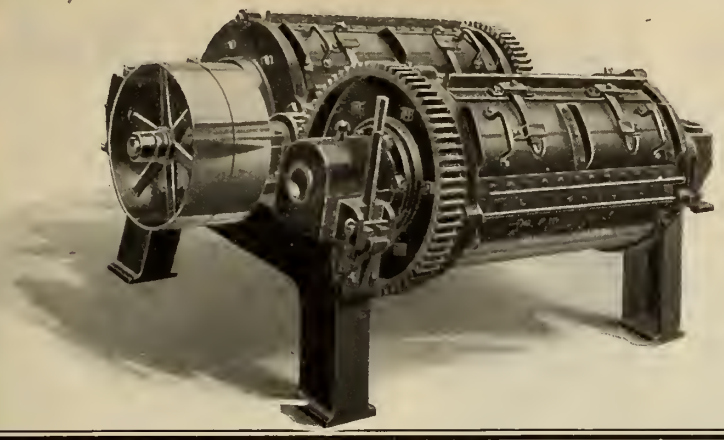
PIG IRON

(ALL GRADES)

FERRO MANGANESE—FERRO SILICON

Stock and Import

A. C. LESLIE & CO., Limited, MONTREAL



EXHAUST TUMBLING MILLS BUILT IN DOUBLE FILE

Constructed in the same efficient manner as all other McDougall products.

Each Mill may be run separately, which proves a decided advantage when filling or emptying.

Properly protected Ring Oiling Bearing.

Guaranteed for Long, Continuous, Satisfactory Service.

THE R. McDOUGALL CO., LTD.
GALT, ONTARIO

WINDSOR and DETROIT

E. S. Bryant Pattern Works, Ltd.

WOOD AND METAL PATTERNS

201-203 Glengarry Avenue, Windsor, Ont.

PHONE 5150

Special attention given to Construction, assuring best Foundry and Machine Shop results.

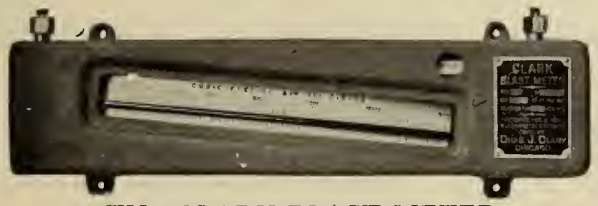
Patterns!

Phone Adelaide 5439

Put your pattern problems in our hands. Quality work and prompt service assured. Patterns made for all foundry purposes—wood and metal, models and aluminum plate work.

The A. J. HAMILTON PATTERN WORKS

120 Adelaide Street West, Toronto



THE CLARK BLAST METER

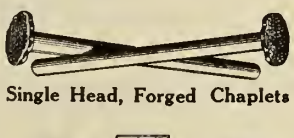
indicates the number of cubic feet of air or gas passing per minute.

The Meter is furnished in any capacity desired, each one built to order and guaranteed in every respect. Several hundred are in use in smelters, steel works, coke plants, etc.

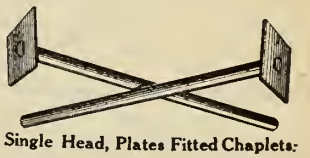
Booklet cheerfully sent—write for it.

CHAS. J. CLARK BLAST METER CO.
Gladbrook, Iowa

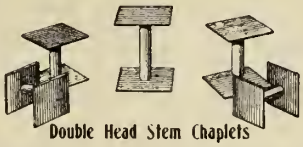
FOUNDRY CHAPLETS MADE IN CANADA



Single Head, Forged Chaplets



Single Head, Plates Fitted Chaplets



Double Head Stem Chaplets

Tin Shell or Ferrule Chaplets

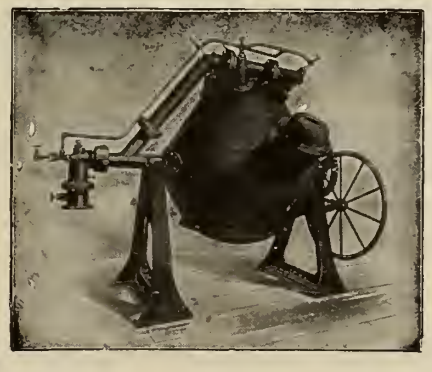
Write for discounts

WELLS PATTERN & MACHINE WORKS

234-236 King Street East, Toronto
Phone Main 3581

Hawley-Schwartz

BETTER melts, in less time and at lower costs, are the results that go with Hawley - Schwartz Melting Furnaces. They are economy producers in every sense.



The Perfect Melter

THE Hawley - Schwartz heats uniformly and will handle all metal from 50 lbs. to 10,000 lbs.

Write for catalogue and complete information.

The Hawley Down Draft Furnace Co., Easton, Penn., U.S.A.

Cleco Pressure-Seated Air Valves for Foundry Work

The valve that improves with use.

Style A

Style A—30° Angle Valve, allows hose to fall away from underside of Valve without bending. Sizes, ½" and 3-4".

Style F.W.

Style F. W.—Four-Way Valve, is so arranged that movement of the handle controls the supply and exhaust from both ends of a double acting piston.

The Air Pressure is always on the Large end of Valve Plug holding it firmly on Seat.

Write for Bulletin 50, describing our complete line of Valves and Fittings.

Style R. A.

Style R. A.—90° Angle valve allows the hose to fall away from under ride of valve without bending. Sizes 1-4 inch, 5-8 inch, 1-2 inch and 3-4 inch.

BOWES PRESSURE TIGHT AIR HOSE COUPLINGS

Standard Equipment Everywhere

Instantly connected or disconnected. Absolutely air-tight under all pressures from 10 lbs. upwards.

Cut Shows Never Slip Clamps Attached

Interchangeable, in all sizes from ¼-in. to ¾-in. Made of non-rusting and acid-resisting metal-brass and Nic-a-loy.

IN STOCK—Chipping Hammers, Sand Rammers, Portable Emery Grinders, Cleco Air Valves, Hose Fittings—everything required in foundry work.

Illustrated Catalog No. 19 mailed on request.

CLEVELAND PNEUMATIC TOOL Company of Canada, Limited

84 Chestnut St., TORONTO, ONT. 337 Craig St. W., Montreal, Que.

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A Good Line to Hook On

There is a certain rule of acquaintance that causes us to like to walk and talk with people whom we know; that also makes us like to get back home at vacation's end.

If you have found–as I believe you have–my line of FOUNDRY FACINGS and Foundry Supplies "a good line to hook on," then that acquaintance will warrant the further mention of my line of Buffing Compositions and Platers' Supplies manufactured by me and wherein the same careful scutiny is exercised. Some of them are:

Stevens Tripoli Compositions

There is concentrated energy in these—"every particle a cutting article."

Stevens Union Maid White Polish

This goes to make the "looking glass finish" so much desired.

Stevens White Columbia Coloring

That gives to brass the glory of gold. It "makes a finish that won't diminish."

Foundrymen who operate an Electro-Plating or Polishing Plant can combine both of my lines of foundry and Plating-Polishing Supplies and find them worthy to "hook on."

Frederic B. Stevens

Manufacturer of Foundry, Electro-Plating and Polishing Supplies and Equipment
Cupola Blocks, Fire Brick and Clay

Corner of Third and Larned Streets
DETROIT, MICH.

CANADIAN BRANCH: Windsor, Ont.

You Can Sell Only Good Castings

Why Make Bad Ones?

It is granted that a runout or a poorly made mold or core will spoil a casting and as no one is infallible, there will be SOME DEFECTIVE CASTINGS but statistics prove that casting losses can be held between 1 and 5 per cent.—depending on the line of work.

Every good mold closed and clamped right, poured carefully of the proper mixture, SHOULD PRODUCE A GOOD CASTING.

Big profits for certain lines of manufacture enabled many foundrymen to get by in the past, altho their losses exceeded 5, yes 10 per cent., but the old era of WORKING AND SAVING is here to stay and more than 5 per cent. loss on any line will bear investigation.

You have bought material and labor for years, now buy McLAIN'S SYSTEM which contains the BEST information on how to use both. It has been accepted as standard in foundries all over the world.

Nothing you can buy for the foundry will save you as much money and as many castings as McLain's System.

McLAIN'S SYSTEM, Inc.

700 Goldsmith Bldg. Milwaukee, Wis., U.S.A.

McLain's System, Inc., 700 Goldsmith Bldg., Milwaukee, Wis.
I am interested in
STEEL
Crucible
Converter
Electric
Open Hearth
Semi-steel
Gray Iron
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Name .....
Address .....
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11-21

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, England.

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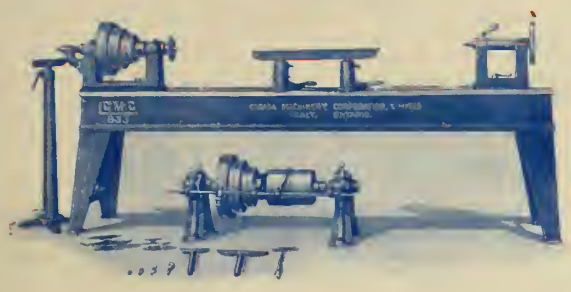


833—Wood Lathe, Iron Bed

823—16-inch Buzz Planer

Good Tools for the Pattern Shop

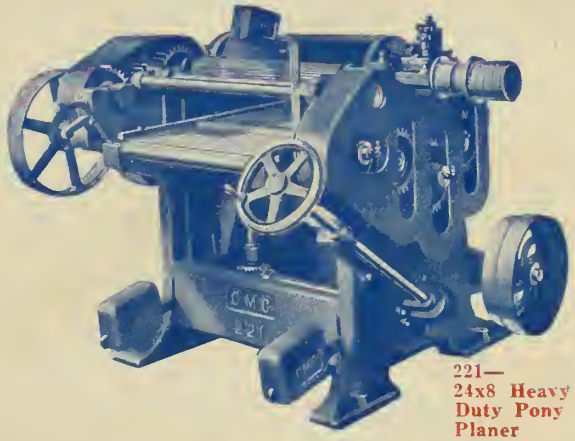
These high-grade tools of the latest design will be found particularly suitable for the pattern shop.

We have installed many pattern shop equipments and will be pleased to furnish details and illustrations.

CANADA MACHINERY CORPORATION LIMITED

GALT - ONTARIO

Toronto Sales Office : 721 BANK OF HAMILTON BLDG.

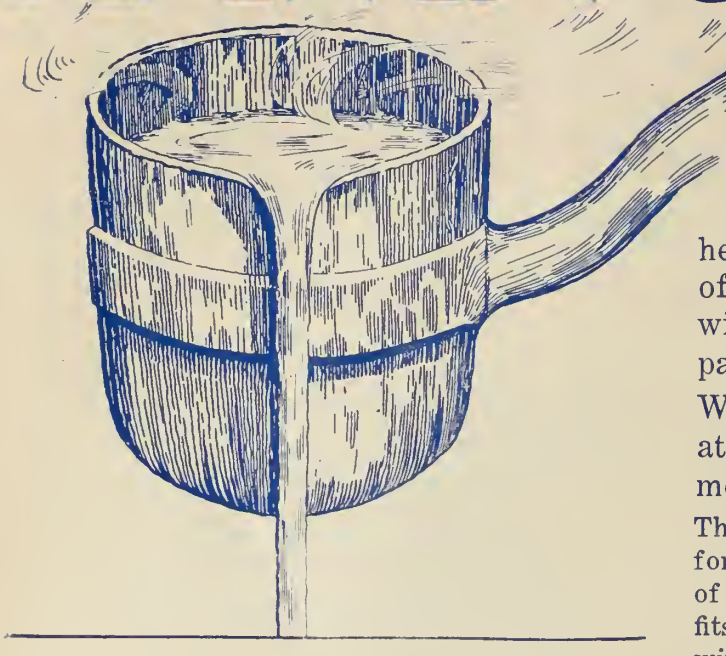


221—
24x8 Heavy
Duty Pony
Planer

617—Variety Saw

714—
36-inch
Band
Saw

KAWIN SERVICE



"Building from the Ground up"

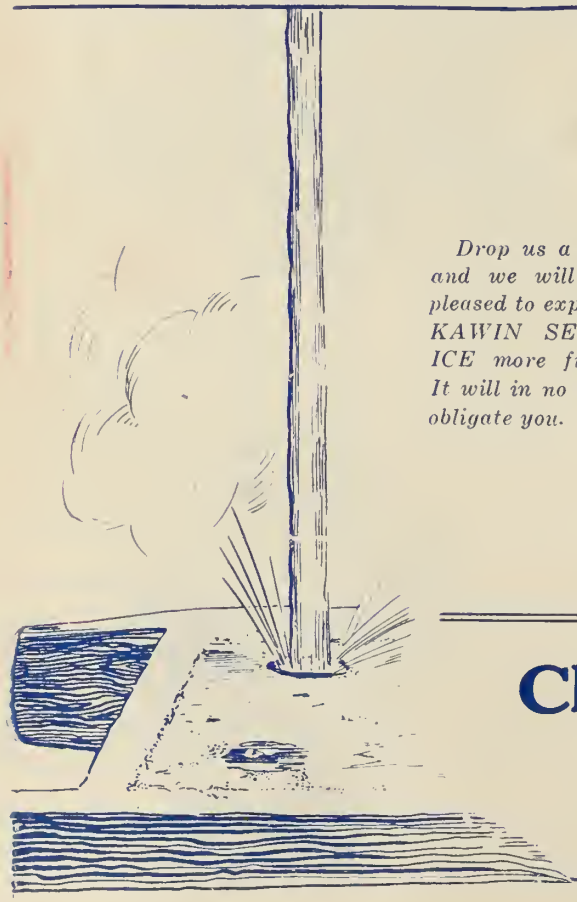
IT has always been a logical theory that where an automobile has been built "from the ground up" it can't help being a mighty fine car. The reason of course is that every part is constructed with regard to its relationship to the other parts.

Where a foundry is planned, built and operated according to definite pre-established methods the same is bound to hold true.

These established methods you can use in the form of KAWIN SERVICE—an organization of highly trained men giving you all the benefits gained from 20 years practical experience with foundry problems of every kind.

Think what this means to your business. It means that when you want alterations or new equipment you are guided by the most approved methods known to foundry practice. It means that at all times you have expert advice on up-to-date cupola practice, on the economical purchase of raw materials, on the chemical analysis of your mixtures—in fact on every subject that may arise.

Can you afford to be without this valuable advisory service? So successful has Kawin been with other foundries that you are guaranteed a 100 per cent. saving over and above the cost of Kawin Service.



Drop us a line and we will be pleased to explain KAWIN SERVICE more fully. It will in no way obligate you.

Chas. C. Kawin COMPANY

307 Kent Building, Toronto

Chicago, Ill. Cincinnati, O. Buffalo, N.Y. San Francisco, Cal.

Chemists--Metallurgists Foundry Engineers

Some Points to Consider

In Buying

FIRE BRICK

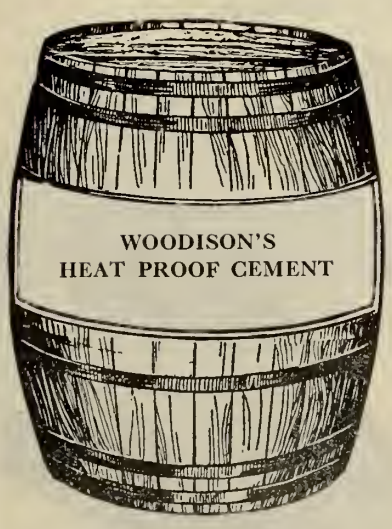
NO one fire brick can possibly be adaptable for all purposes. When a manufacturer tries to sell on this basis be wary. Remember that replacement costs come high and a cheap brick of poor grade will soon need replacing.

Over twenty-five years experience in the fire brick business has taught us that the highest form of economy comes from choosing a brick **adaptable to your work.**

This being so, we have selected brick from different localities, which have proven themselves best for certain kinds of work.

We can give prompt service in supplying bricks for Rebuilding Core Ovens; Replacing Boiler Settings; Relining Oil, Malleable, Brass or Heat Treating Furnaces.

If you need Fire Clay, get our estimates on a very refractory clay especially adaptable for Cupola Linings, Middle Inwalls of Blast Furnaces, Hot Blast Stoves, Boiler Linings and similar purposes. We also supply Canisters for use with Clay to daub ladles, cupolas and furnaces.



Our Heat Proof Cement

Adds Years of Life to Refractory Walls

This is a plastic asbestos compound—absolutely impervious to heat. Anyone can apply it. Is just like ordinary fire clay mortar, but sets hard as a rock and preserves walls much longer than fire clay. Used for Boiler Settings, Bridge Walls, Boiler Arches, Heat Treating Furnaces, Brick Kilns and for many other purposes.

When you buy Woodison's products you buy direct from the manufacturer and save all middlemen's profits. Write for price list without delay.

Prompt shipment and rock-bottom prices on the following high-grade equipment: CORE OVENS, SNAP FLASKS, LADLES, CUPOLA BLOCKS, CRANES AND HOISTS, FOUNDRY CASINGS.

The E. J. Woodison Company, Limited

Foundry Requisites, Fireclay, Firebrick and Equipment

TORONTO, ONT. MONTREAL, QUE.

"PRESTON" Woodworking Machinery

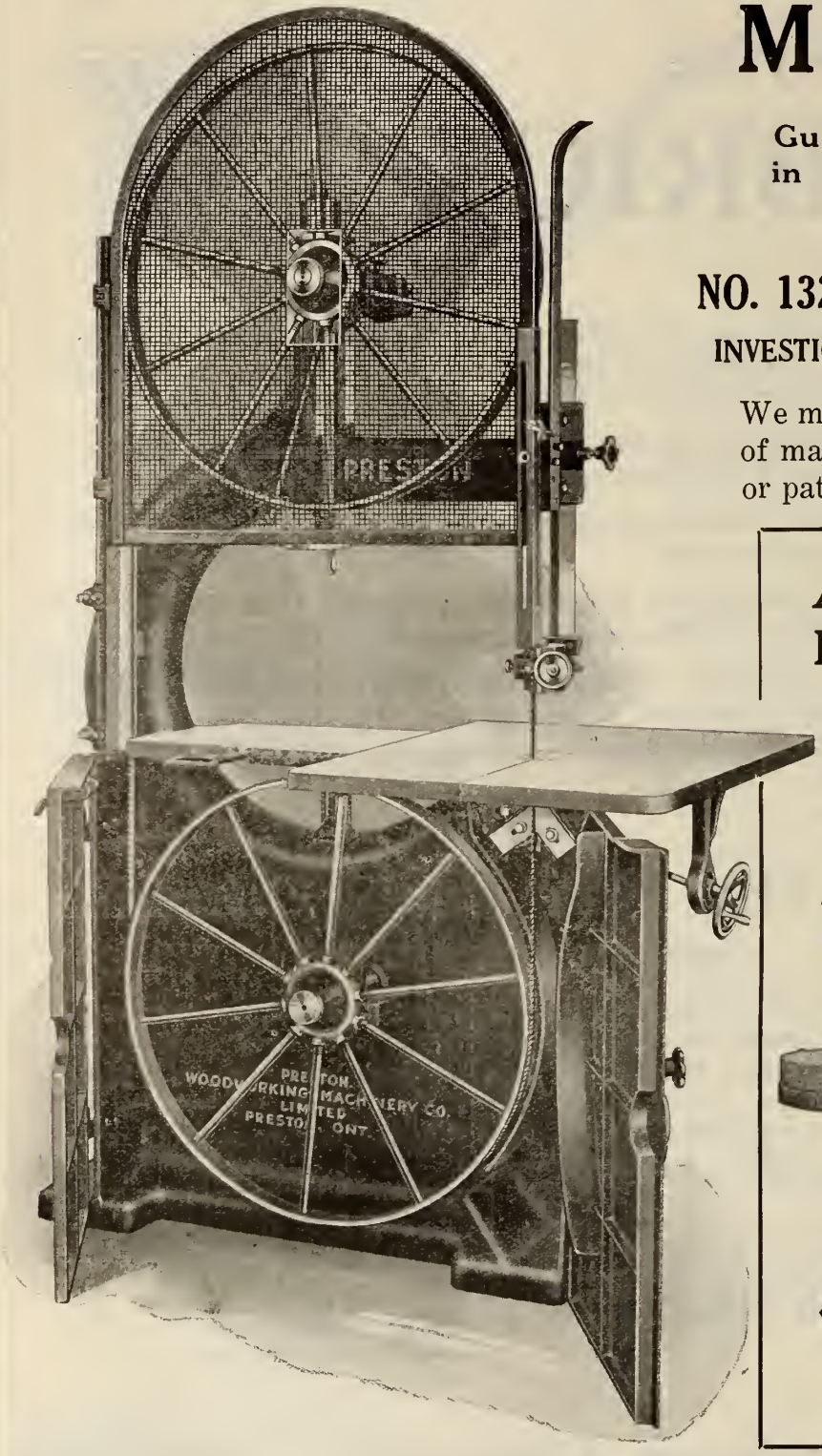
Guarantees Better Work in your Pattern Shop

THIS IS OUR

NO. 132, 36 INCH BAND SAW

INVESTIGATE ITS SPECIAL FEATURES

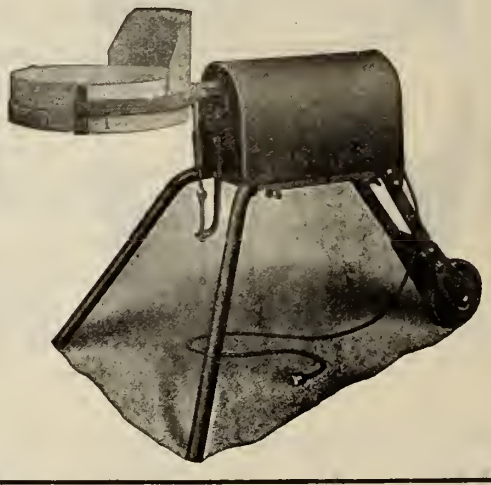
We manufacture a complete line of machinery for your carpenter or pattern shop.



A Message To Foundry Men

A ten-day free trial of our Ball Bearing Electric Sand Riddle will convince you that it will pay for itself in a few months.

"Sift Sand by Electric Power and Cut Down Your Pay Roll"



PRESTON WOODWORKING MACHINERY COMPANY, LTD.,

PRESTON, ONT.

A Day's Results With

Any Type Of

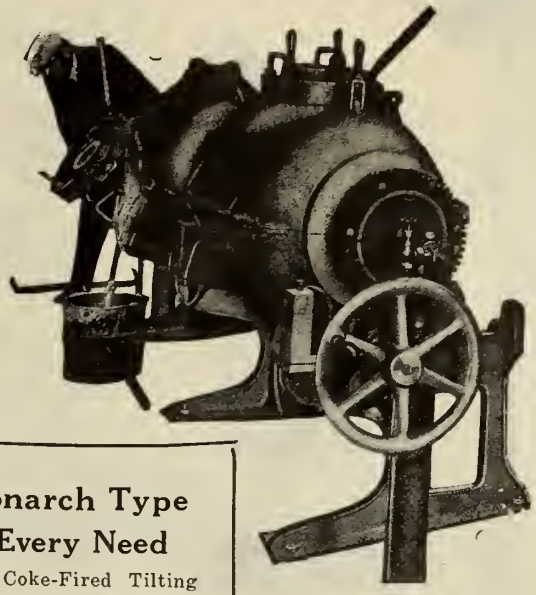
MONARCH

Melting Furnace

invariably shows more heat than could be accomplished with any other similar type. This is the true test of furnace efficiency.

NOTHING succeeds like success. The successful results (practically twice as many melts without additional cost) which users get with the **Monarch Rockwell Double Chamber Melting Furnace** lie in the fact that this furnace is literally "2 furnaces in 1." It utilizes all the heat and prevents oxidization.

Other types of Monarch Furnaces are also big economizers. One user gets 30 to 40 average heats per crucible with a Monarch Crucible Tilting Coke Furnace—an indisputable proof of even heating.



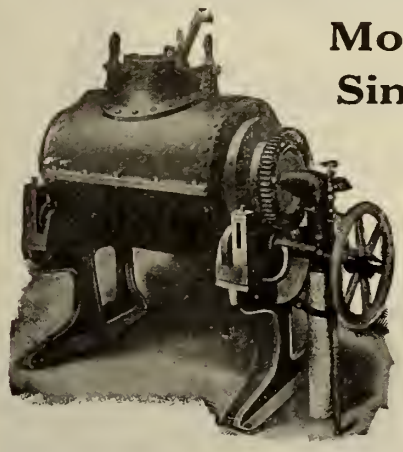
MONARCH ROCKWELL Double Chamber Furnace: for copper, brass, aluminum, iron, steel, gold, silver, etc.

A Monarch Type For Every Need

Monarch Coke-Fired Tilting Crucible Furnace; has Hopper Feed and Shaker Grates.

Monarch Steel-Harvey Crucible Tilting Furnace, Oil or Gas

Monarch Simplex



Heats by open flame.

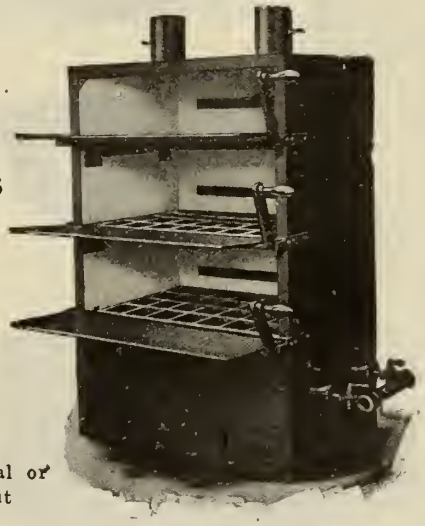
Operates on liquid fuels, oil or gas. Crucible expense is entirely eliminated, susceptible to minute adjustment enabling a product of tap quality.

Monarch-Arundel and Acme Core Ovens

All Fuels, All Sizes

All equipment for brass and iron foundries.

Furnaces for oil, gas, coal or coke. With or without crucibles.



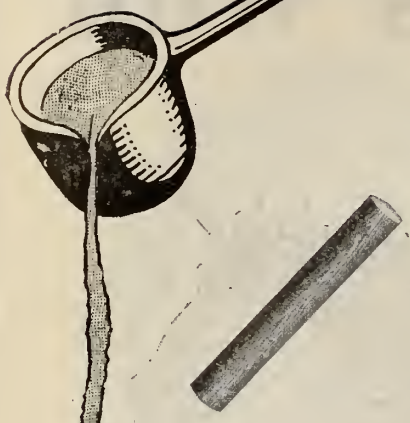
Write for Catalog T.F. It shows the MONARCH Line in full.

The Monarch Engineering & Mfg. Co.

1206 American Building Baltimore. Md., U. S. A.

Works: Curtis Bay, Md.

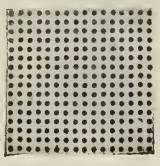
Sterling



Foundry Specialties
Are
Foundry Necessities

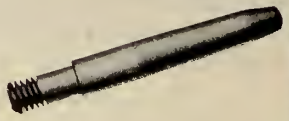
Losses

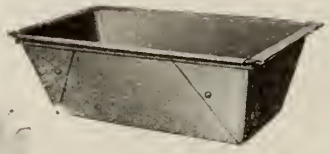
A skilled moulder making wedges or gate sticks —production retarded— dirt in the castings; wasteful effort—needless steps. These profit leaks can be turned into



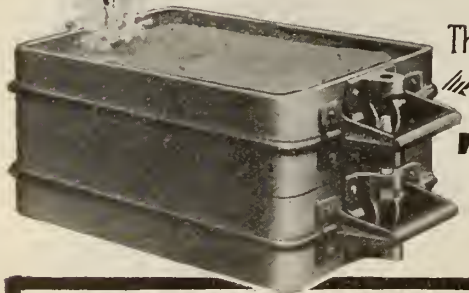
Gains

Skilled labor properly applied — production speeded up—clean casting —efficient effort—steps that count. Let us help convert your losses into gains.



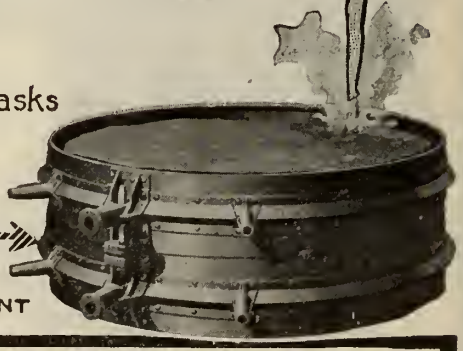


The Only Line Of Rolled Steel Flasks



SOLID CENTER RIB

ANGLE REINFORCEMENT



STERLING WHEELBARROW COMPANY

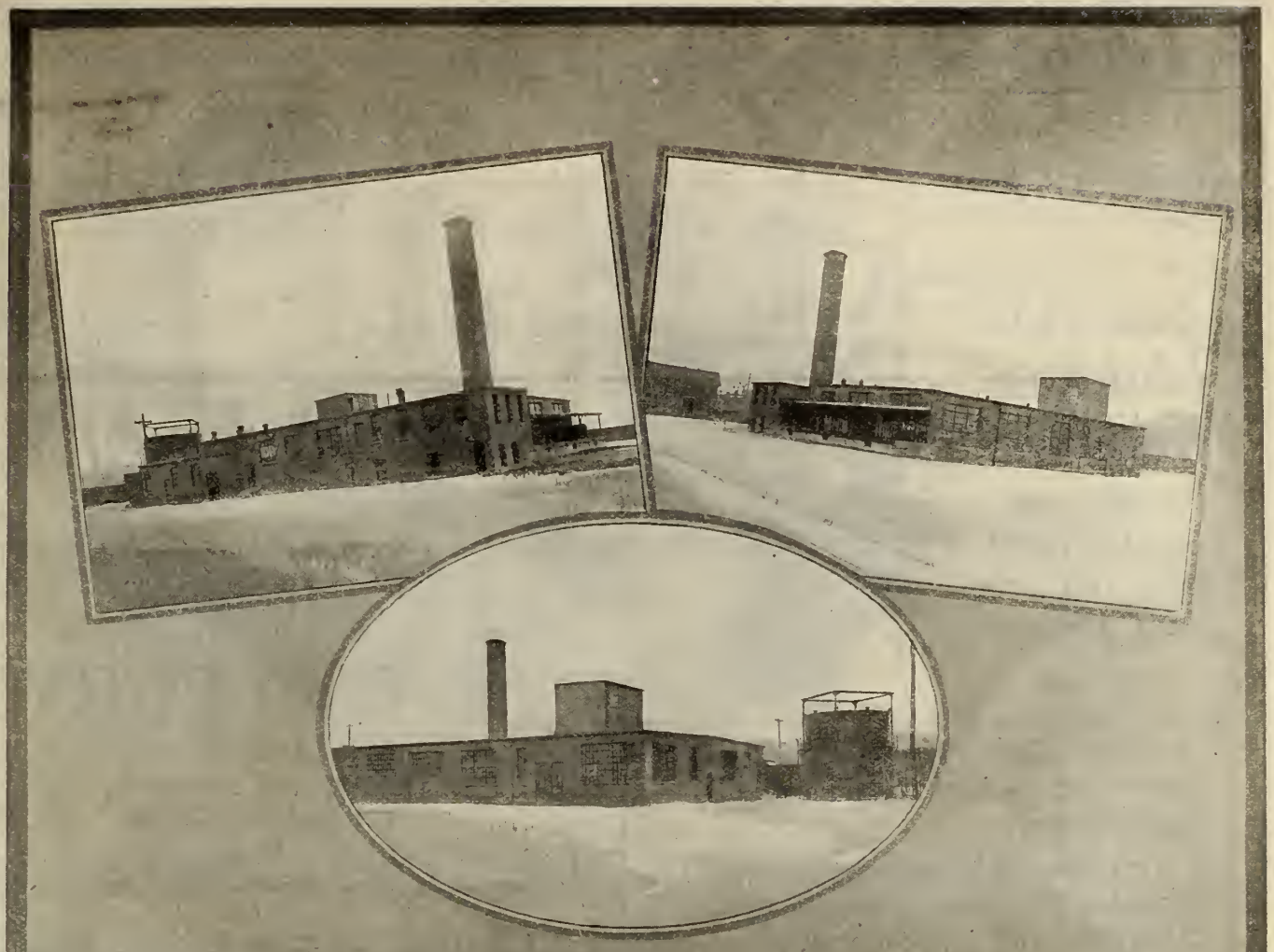
STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

NEW YORK
BOSTON
CLEVELAND

MILWAUKEE, WIS.

CANADIAN AGENTS-MUSSENS LIMITED, MONTREAL, TORONTO, WINNIPEG, VANCOUVER

DETROIT
CHICAGO
ST LOUIS



Dominion Oxygen Company's New Plant at Montreal

TO accommodate the rapidly increasing demand for Dominion Oxygen, this new plant has been built and is now operating to full capacity in Montreal. Our customers in Montreal and adjacent territory are using such large quantities of Dominion Oxygen that the Distributing Station has been replaced by this Manufacturing Plant, where ample reserves will be maintained to give you an immediate supply —whether only one cylinder is required or a hundred.

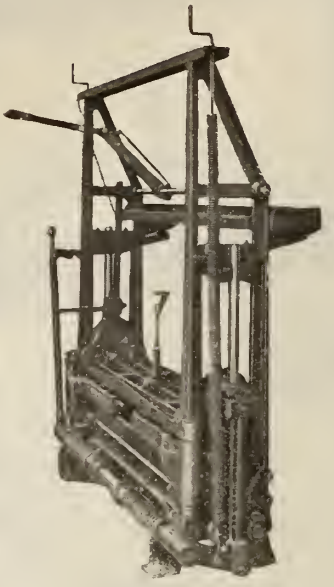
With two Plants and four Distributing Stations, we can fill orders for any quantity of Oxygen the same day as they are received.

Dominion Oxygen Company Limited

Plants at Toronto and Montreal

Distributing Stations — Hamilton, Merritton, Welland, Windsor

AMERICAN



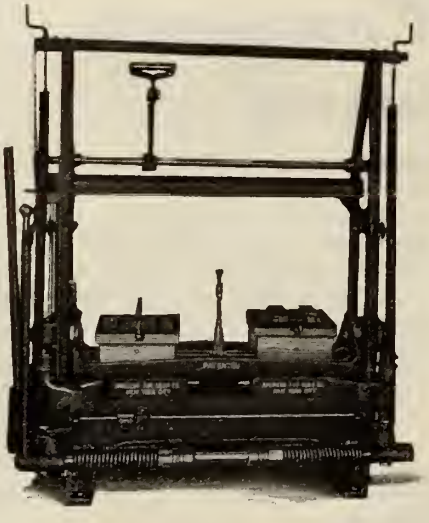
No. 611 *Molding Machine*

makes the complete mold, using the original pattern.

Jolts, rolls over, squeezes and draws the pattern, both cope and drag together.

The No. 611 is hand-operated, requiring no power or expensive air. It is simple and light running.

No costly match plates necessary. Patterns changed quickly.



Makes you independent of high priced molders.

EQUIPMENT

THE AMERICAN FOUNDRY EQUIPMENT CO.
366 MADISON AVENUE, NEW YORK CITY.

WHITEHEAD'S KAOLIN

Most reliable material for lining and patching Cupolas, Furnaces, Ladles, etc., saves time, labor and firebrick.

E. B. FLEURY

AGENT
1609 Queen Street W.
TORONTO, ONTARIO

DIAMOND

MASTER FLASK

Diamond Master Flasks are light in weight, easy to handle, accurate and very durable. Their convenience and accuracy result in a larger and better production. Let your next order stipulate Diamond Master Flasks.

Sold in Canada by
Dominion Foundry Supply Co.; Whitehead Brothers Co.; E. J. Woodison Co.; Frederic B. Stevens; Hamilton Facing Mills Co., Ltd.

DIAMOND CLAMP & FLASK CO.
40 N. 14th Street, RICHMOND, INDIANA, U.S.A.

If It's a DAMP Core Oven

The Damp All-Steel Welded Core Oven

--*It Will Last About as Long As Your Foundry*

Damp Core Ovens last so long and give such efficient service because they are all-steel constructed and welded throughout by the Damp wear-defying process. The grids are built of welded steel. The entire construction is designed to prevent the loss of heat.

DAMP All Steel Welded Flat Bottom LADLES

The Welding Marks the Difference

Get Details of Our
GEARED LADLES
From 1800 lbs. Up
Strong, Durable, Long-Lasting

Where rigid strength sufficient to withstand strenuous use and abnormal conditions is needed, the Oxy-Acetylene Welding process comes to the rescue as can nothing else. Note the group of ladles in the lower right. They were made entirely by this method. The extra service they give in actual use proves the wisdom of purchasing ladles "welded the Damp way."

Damp Ladles are made in capacities of 50, 100, 150, 200, 250, 300 and 350 lbs. or larger. Get our prices before you place your next order.

Our products sell lower than jobbers' prices. Ask for prices on Ladles of all kinds, Steel Bands, Shanks, Core Plates, Wooden Snap Flasks, Slip-Over Jackets.

DAMP BROS Manufacturing & Welding Co.

852 Dupont Street, Toronto, Ontario

ALL IRON AND STEEL FOUNDRIES

SHOULD BE EQUIPPED WITH

STEWART WHEEL MOULDING MACHINES

WRITE FOR PRICE AND PARTICULARS TO

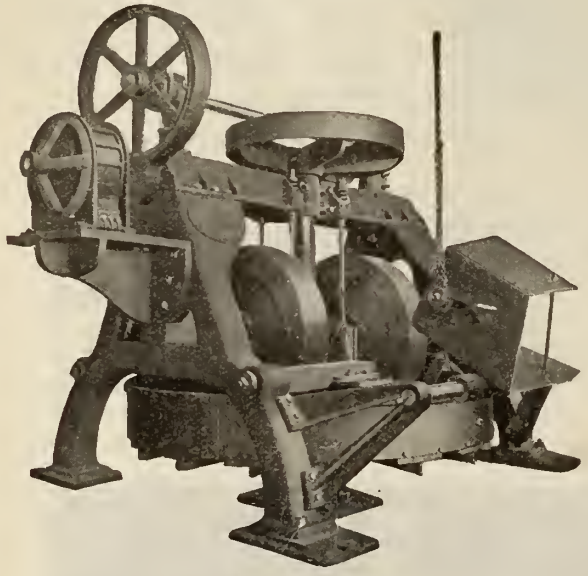
DUNCAN STEWART & Co., Ltd.

LONDON ROAD IRON WORKS, GLASGOW, SCOTLAND

Frost

Wet Pan Sand Mill

for Steel Foundries

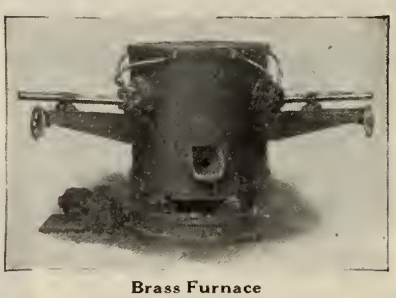


The Frost Mfg. Co.

112 W. Adams St.
Chicago, Ill.

"VOLTA" Electric Furnaces

Steel Furnace



Brass Furnace

Steel Furnaces 100 lbs. to 15 tons capacity.

Grey Iron and Ferro-Alloy Furnaces. In sizes to suit customer.

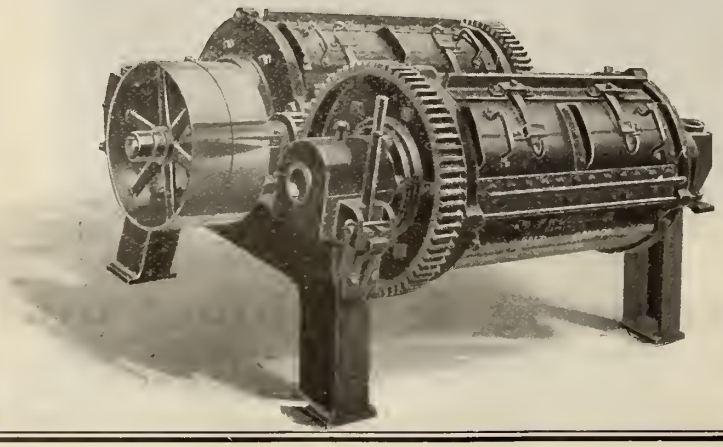
Brass Furnaces Three - Phase, in standard sizes of ⅛, ¼, ½ and 1 ton capacity.

Electric Furnace Accessories of all kinds.

Estimates and General Information cheerfully given.

The Volta Manufacturing Company, Ltd.

WELLAND, ONT.



EXHAUST TUMBLING MILLS BUILT IN DOUBLE FILE

Constructed in the same efficient manner as all other McDougall products.

Each Mill may be run separately, which proves a decided advantage when filling or emptying.

Properly protected Ring Oiling Bearing.

Guaranteed for Long, Continuous, Satisfactory Service.

THE R. McDOUGALL CO., LTD.

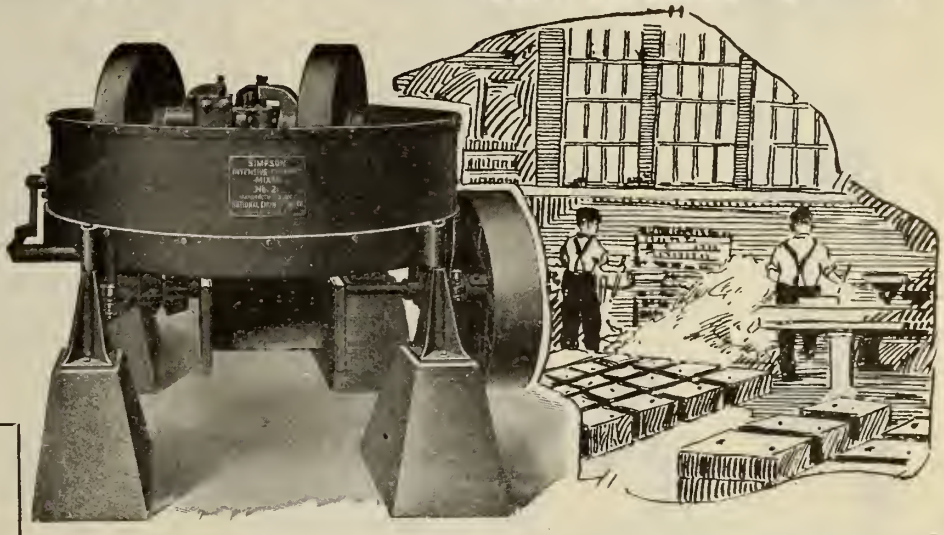
GALT, ONTARIO

Simpson INTENSIVE FOUNDRY MIXER

"The Product of a Practical Foundryman"

"It Has Saved Us 50% in Labor"

Detroit Foundry Co.



Used in Canada by

Canadian Westinghouse Co.,
Dominion Foundries & Steel, Ltd.
Canadian Pacific R. R.
Canadian Steel Foundries Ltd.
Thos. Davidson Mfg. Co.
Dominion Bridge Co.
Robt. Mitchell & Co.
Ontario Specialties Ltd.
Canadian Ingersoll-Rand Co. Ltd.
Dominion Iron & Steel Co.
Electric Steel & Metals, Ltd.
Canadian National Railway.
Crane, Ltd.

Economical and Efficient for all kinds of Sand Mixtures in Foundries Producing Steel, Grey Iron Malleable, Brass and Aluminum Castings

The Mixer that Saves Sand

Are you still sticking to hand mixing in preparing your sands? Do you know that this old method takes more new sand, creates a surprising amount of defective castings, demands high labor costs and is far more expensive in the end?

Get these facts! In 1920 the Geo. Cutter Company of South Bend, Indiana, saved $6.00 per day mixing core sand and facing sand with a Simpson Mixer. In the same year, T. Shriver & Company of Harrison, N.J., estimated a net yearly saving of $3,000.00 on new sand. And there is no reason why such results can't be applied to your business.

Look what a **Simpson Mixer** will accomplish for you! It will enable you to reduce your operating expenses as well as maintaining or increasing the quality of your castings. It saves labor, binder, new sand and will pay for itself in a short time. We are specialists on sand mixing equipment and our experience is at your service.

Send for Circular No. 50 and list of users.

NATIONAL ENGINEERING CO.

549 W. Washington Blvd. CHICAGO, ILL.

PRESSURE SEATED AIR VALVES

"The Valve That Never Leaks"

Style S.L.

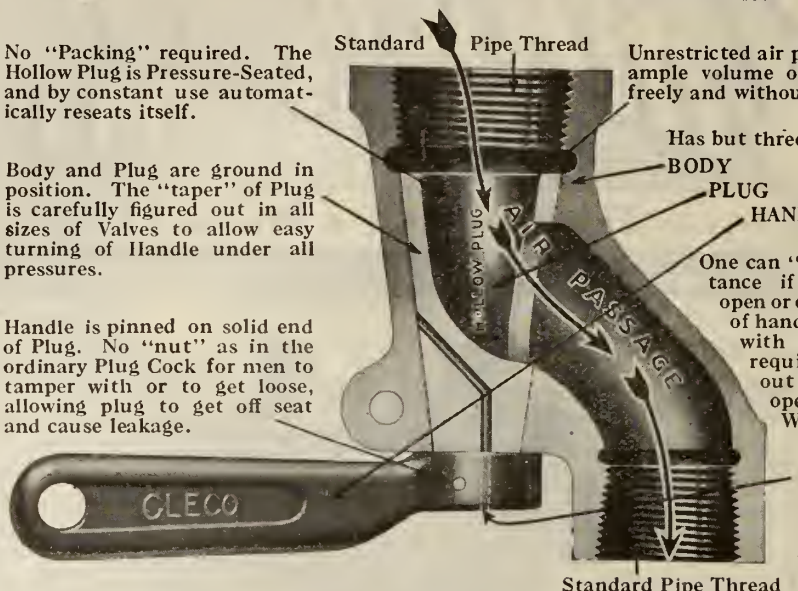
Style L.W.

Style F.W.

No "Packing" required. The Hollow Plug is Pressure-Seated, and by constant use automatically reseats itself.

Body and Plug are ground in position. The "taper" of Plug is carefully figured out in all sizes of Valves to allow easy turning of Handle under all pressures.

Handle is pinned on solid end of Plug. No "nut" as in the ordinary Plug Cock for men to tamper with or to get loose, allowing plug to get off seat and cause leakage.



Unrestricted air passage allows ample volume of air to pass freely and without friction

Has but three parts:—
BODY
PLUG
HANDLE

One can "See" from a distance if Cleco Valve is open or closed by position of handle. Other makes with "Wheel" control require a visit to find out if Valve is fully open or partially so. Why waste time?

Waste Port which permits the air in Hose to escape to atmosphere when Valve is closed.

"The Valve That Improves With Use — Requires No Attention After Installation"

Style R. A.

We Manufacture

The Well Known Bowes Air Hose Coupling

In Stock—Riveting and Chipping Hammers, Air Drills, Air Grinders, Sand Rammers, Holder-Ons, Etc. *Bulletins 46, 48 and 49 Mailed on request.*

Style A

Cleveland Pneumatic Tool Co. of Canada, Ltd.

TORONTO, ONT. MONTREAL, QUE.

"HAMILTON"

PIG IRON

THE STEEL COMPANY OF CANADA LIMITED

WE absolutely guarantee the quality of "HAMILTON" MACHINE CAST FOUNDRY AND MALLEABLE PIG IRON because we control its production from the mines to the finished product.

Iron Ore and Coal from our own mines; low sulphur By-Product Coke produced at our own plant. All pigs are machine cast and uniform in size, and, if desired, shipments can be made the day the order is received.

HAMILTON - MONTREAL

Cramped Quarters are Pie to the Combs GYRATORY FOUNDRY Riddle

Hang it Up on Anything Handy!

Suppose a moulder gets into a crowded corner with a big pile of sand ahead of him. If he is an energetic person he will object to the time wasted with an ordinary riddle that has legs to hinder his progress at every turn.

Conditions such as this are profitably met with the COMBS GYRATORY FOUNDRY RIDDLE. No matter how little floor space or how much work on hand, this device never cries "surrender," **because it has no legs, and because it can be hung up on anything strong enough to support 98 lbs.**

The COMBS RIDDLE is proving a big factor in the economical production of castings because it mixes as well as sifts. This saves one turning of the sand. Its capacity more than equals ten labourers using hand riddles.

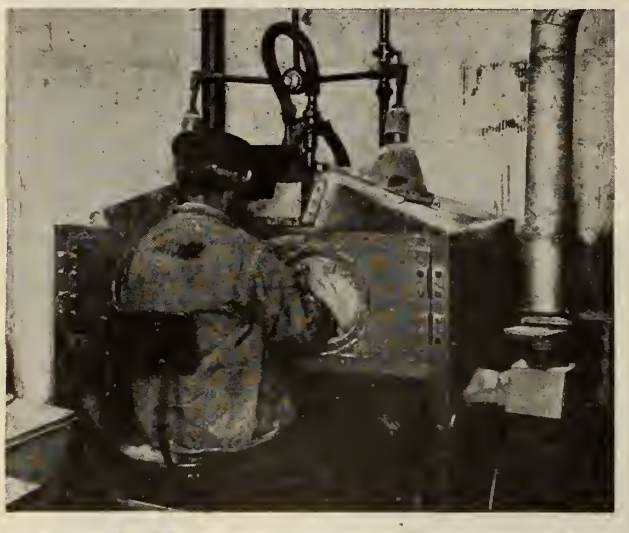
The top illustration shows a Type "V" COMBS RIDDLE working in crowded corner of the General Fire Extinguisher foundry at Warren, Ohio. The Gyratory motion of this machine is keeping their upkeep costs extremely low.

Don't you want to know all the things this unusual riddle can do for you? We'll be glad to tell you. It is made in Toronto but write us for particulars.

Read these facts!

1. Only one bearing outside the motor.
2. Totally enclosed motor; all bearings dust-proof.
3. There are no gears.
4. Easy adjustable sieve.
5. Mixes as well as sifts.
6. Economical to operate.

Great Western Manufacturing Company, LEAVENWORTH, KANSAS



SLY SAND BLAST EQUIPMENT

Sandblast Cabinets

of every description and for every conceivable purpose.

The Cabinet shown in the illustration is best adapted for sandblasting intricate work, light enough to be handled and held by hand under the stationary sandblast nozzle.

A Cabinet similar in construction to the above but with a hand operated nozzle is used to better advantage on heavier and larger work that could not be conveniently handled under a stationary nozzle.

For work such as engine castings, crank cases and the like, a Turntable Cabinet is of considerable advantage. Instead of doors for bringing the work into the housing for sandblasting, this cabinet has a turntable with grated top, half inside and half outside of the cabinet. The pieces to be cleaned are placed on the outside half of the table; the latter is then given one half turn which places the work into the cabinet and leaves the other half of the table for receiving additional work.

Cabinets for Steel Rods, Tubing, Bath-tub Castings, Steel Bands, Glass Ware, Pottery, etc.

The W. W. SLY MFG. CO.

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Pattern Making and Molding Must Harmonize

By the Two Departments Working in Harmony, Many Mistakes Can Be Avoided, Life Be More Livable for Both Parties and Better Results Accomplished

A TRADE, or calling, which does not receive any more consideration than is rightfully due to it is that of pattern making. The reasons for this are varied. One very important reason for this is that very few people know what the duties of a pattern maker really are. They know that there are those who make patterns in connection with millinery, dress making, tailoring, tinsmithing and almost every line of business, but they know that these are not what are known as pattern makers. They know that a pattern maker is in some way connected with the foundry business because they see him coming out of the same outlet when the whistle blows, but his general appearance is such as will banish all thought that he works in the foundry.

The pattern maker is in many respects the most important man in the business. His duty is to put the designer's ideas into actual being so that the foundryman can convert them into metal.

A molder can not make much use of an idea unless it is a very simple one, but the pattern maker takes the most complicated idea and models it in such a manner that the molder can begin where he left off and do his bit which is only another step towards the finished article.

From this it will be seen that while the pattern maker's department is small compared with the other departments of a manufacturing establishment, it is nevertheless clearly an essential one.

To be a good pattern maker capable of taking charge of a pattern shop, a man requires considerable mechanical and artistic ability. The pattern maker must understand how to read drawings and he is in a better position if he understands how to make drawings. He must have a general knowledge of machine shop practice as well as molding, but his chief duty is to please the molder—a duty not always easy to perform.

The pattern maker and the molder would seem to be about as far remote from each other as any two human beings could possibly be, as the pattern maker wears a white shirt and white collar, a white apron and white hat, and keeps his hands and face nice and white. In fact his very surroundings are suggestive of cleanliness. The molder on the other hand, usually dresses in black; generally has his hands and face shaded with black to a sufficient extent to preclude the thought that there is anything white about him excepting his heart. His surroundings, also differing from those of the pattern maker, do not present a very dazzling white appearance, yet with all their apparent difference there are no two callings which are more interwoven with each other than those of the pattern maker and the molder, and neither, can hope for much success without a knowledge of the other's work.

The trades, however, are as different from each other as the men. The pattern maker's tools and equipment as well as his every movement must be more in the line of exactness than what is generally considered necessary in the foundry. But all things considered the subject of "Pattern makers and pattern making" is one which should be right at home in a foundry publication. That the two branches of the business shall work in harmony, is an essential which can not be overlooked if the success of the business is considered. In undertaking jobs in the foundry where only a few castings are wanted it is quite often that the pattern maker and the molder can get together and devise means of doing quite difficult mold-

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ing with very little expense for patterns. In making expensive patterns for repetition work, it is equally as important that the two get together and settle all the details so as to have the pattern to work to the best advantage when in use in the foundry.

In making metal match plates or fitting patterns to molding machine, both kinds of experience are required. In fact, there is practically nothing which is being done in either department but where the other department can be requisitioned to advantage.

Bearing all of this in mind, I will put them both in the same category and will endeavor to show some work which will be of interest to both callings. The paper on the subject of making patterns for gearing which was begun in last issue will be continued in this issue and should be of interest to every class of mechanic. It will not be easily understood without a lot of study but this is well worth while.

Another subject which was announced in last issue is that of propeller wheels. As we pointed out, this is a line which will always be in demand in Canada. By courtesy of The Norman W. Henley, Publishing Co., of New York, Publishers of "Practical Pattern Making" we will describe and illustrate the pattern making in connection with this line of work. This is a really interesting and instructive article and should be carefully followed. Pattern making will be a special feature in every issue of this publication hereafter.

In the molding section, the molding of the propeller just spoken of will be attempted, and the reader will observe that this is the method spoken of by the pattern maker, whereby one blade only is required. In future articles we will describe other methods of molding this same line of work. Editor.

Making the Pattern for Screw Propeller

A Detailed Description of Laying Out Each Piece of Lumber, How to Build Them Together and How to Arrive at Proper Pitch

By F. W. BARROWS

AS ANNOUNCED in the last issue of this paper, we will describe and illustrate the pattern making for a propeller wheel such as is used to propel a steamship. It is not the intention to go into any scientific discussion of the merits of different shaped blades, straight or increase pitch, or any of the other points, good or bad, real or fancied, but to try and tell how to construct a pattern for a given pitch and diameter. As the same general directions will apply to all wheels, let us first consider a plain straight pitch—say a wheel 8 feet in diameter and 12 foot pitch. By twelve foot pitch I mean that the wheel would advance twelve feet during one complete revolution if there was no slip. Imagine if you can a bolt 8 feet in diameter having a thread of so steep a pitch that it makes but one turn in twelve feet. Cut a segment out of this thread and you have the blade as stated. This bolt, if turned in an iron

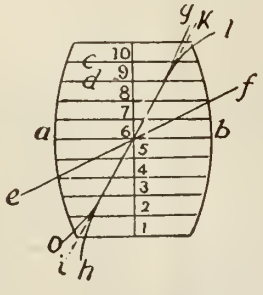


Fig. 1.

nut, would advance twelve feet in one revolution, but in the water there is always more or less slip, as it is called, or lost motion, swing to the yielding of the water, which is the nut for the wheel.

We shall want a drawing first, showing the pitch, shape of hub and thickness of blade at different points, although the thickness can only be located positively at all points, when the outline of the blade is known. Some designers wait until the face of the wheel is worked off before laying out the shape of the blade; so it is customary to allow plenty of stuff on the back side, that

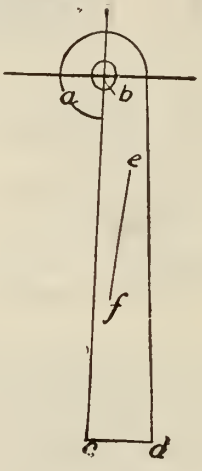


Fig. 2.

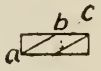


Fig. 3

the thickness of bucket may be so located, after the outline is given, as to give the best backing qualities consistent with strength.

Let the curved lines a b Fig 1, represent the full size and shape of hub desired, and the parallel horizontal lines c d show the courses of pattern; then draw lines showing the pitch at different points. The line e f gives the pitch at extreme length of blades, g h at the point where the fillet between blade and hub begins. You may draw as many more between these two points as you think necessary or as the shape of the blades requires. This is not necessary for a straight pitch, as it can be taken from any point.

Now get a piece of stuff for a templet and dress to a parallel thickness equal to the thickness of courses in pattern. Having determined the center point (b, Fig. 2) draw a circle, a, smaller than the hub, yet large enough to give sufficient strength around the hole for a spindle, shown by the small circle, b, used in molding. Draw a radial line, b c, this is the face of wheel. Measure off on this line four feet from centre b. and cut off the end of templet to this length. Now set a bevel on the pitch at circumference of wheel, as shown by line e f, Fig. 1, and lay this off on end of templet, as at a b, Fig. 3. Then measure thickness required at this point, as c, and draw another line parallel with a b. This last line determines the width of stuff necessary at this point as c d, Fig. 2. By the same operation we may find the width at any point and thereby get the shape of

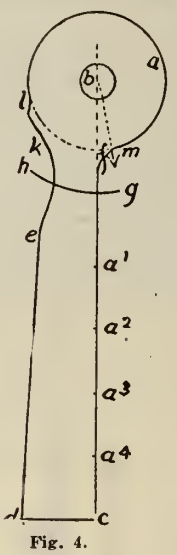


Fig. 4.

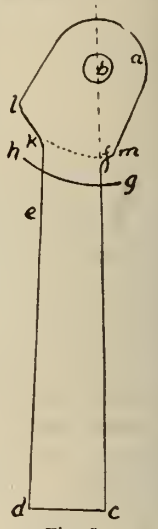


Fig. 5.

back edge of templet, adding as much as you like to chop off again.

You may now cut up the stuff for one bucket, which is all that is usually made, as the molder makes the two, three, or four buckets, as the case may be, from this one pattern by swinging it on its spindle and making as many flasks as wanted. You can count up the courses necessary on the drawing, and it is a good plan to have them numbered. The stuff can be cut pretty nearly the shape desired, which is the shape of templet, Fig. 2.

In cutting up the stuff, see that the grain runs out toward the face, and point, as you will chop off the wheel from the hub toward the point, so the grain should run in the same direction as line e f on templet.

We will now lay out the first course, having dressed the stuff to a parallel thickness and out of wind. Get it out the same thickness as in drawing, Fig 1. If the stuff is thicker than shown on this drawing, and is laid out by the templet, it will be too narrow; and for the same reason, if the stuff is dressed too thin, it will be too wide.

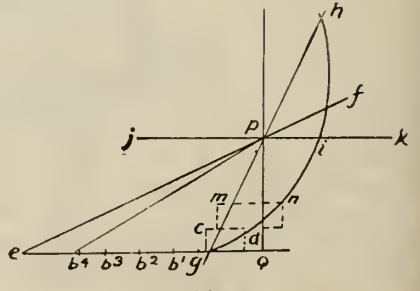


Fig. 6

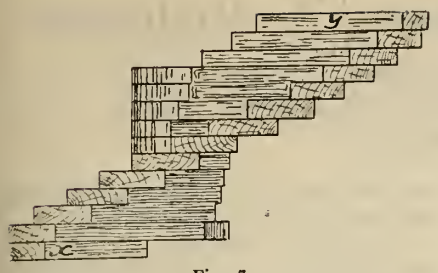


Fig. 7

Turn the piece for course, bottom side up; then lay out a circle the full size of hub on line between courses one and two. From the center of this circle draw a radial line b c, Fig 4. This line is the face of bucket. For the back face lay on the templet, being sure to have the center coincide with the center of course.

A good way to accomplish this is to bore a hole an eighth of an inch in diameter through the center of each course, then use piece of wire that will fit this hole to center each course. Now bring the face of templet to the radial line b c Fig. 4, and mark the width at circumference. The width at line g h Fig. 4. will be seen at c d Fig. 6. The pitch at this point is shown by line g h, and the general outline of back side of blade by curved line g i h. As the blade tapers in thickness from this point to circumference, the line of back should be curved from this point to end of blade like e Fig 4. Layout the fillet between blade and hub as at b and k, draw a line b m from center of hub to center of fillet; draw another circle the same diameter as end of hub. Then cut this course to the full lines, Fig. 4; mark the pitch and thickness on end of course as shown on end of templet, Fig. 3.

The pitch at any point between g h, Fig 4 and circumference may be found as follows-

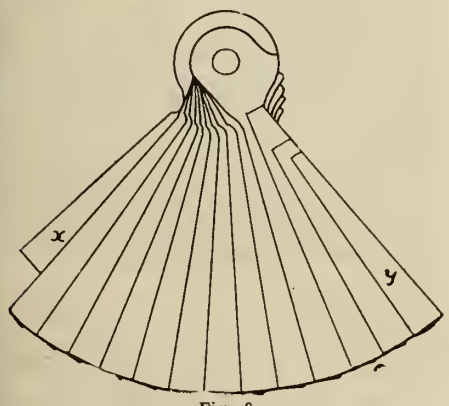


Fig. 8

Let g h, Fig 6, be the pitch at g h, Fig 4, and e f the pitch at circumference, j k the center line and g e parallel with j k; now divide the two lines g e, Fig. 6 and g c Fig. 4, into an equal number of parts a1, a2, a3, a4, and b1, b2, b3, b4. Now a line drawn from center f to b4 will show the pitch line at corresponding point on first course as at a4.

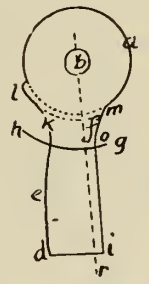
The first course is now ready except boring the hole for spindle. Be careful and bore the hole square through the course and large enough to fit spindle. The point l, Fig 4 is located by the number of buckets; if for four, the distance l m is a little less than one-fourth of the circumference.

Now we have on this first course lines showing the end of the hub, the face of blade, the fillet connecting face of blade with hub, also the outline of hub on joint between one and two courses from l to m.

For the second course, having dressed the stuff, lay on templet and bore small hole through center; mark along the face of templet and around the hub, also the width at circumference. Then remove the templet and draw a circle the size of hub, on line between second and third courses; lay out the fillets and get the width on line g h Fig 5, as from m to n Fig 6. Now from the point m, Fig 5 which marks the intersection of fillet and hub, lay off a distance equal to m l, Fig 4, draw lines from m and l, Fig 5, tangent to circle a, then you have the second course Fig 5. Bore the hole for spindle and mark the pitch and thickness on end of course.

Turn up a hardwood plug or arbor to fit the hole bored for spindle, eight or ten inches long.

Lay the two courses now cut out together,



pushing the plug through both, then moving them until the face of second course exactly coincides with the point where the pitch line on end of first course meets the top surface of course. Then glue them strongly together, using plenty of hand-screws.

While the first joint is drying we will lay out another course, getting the dimensions necessary from Fig. 1, always laying out the course on bottom side.

After the first joint has dried we will put on the third course the same way the second was done. It is a good plan to start by fastening the first course to a pair of trestles; this keeps your work up level and gives a good chance for the hand screws. When it gets up too high, shift it to the floor, always putting on one course at a time, and remembering when we get above the center to take the radius for line l m, the size of hub from line between courses 7 and 6 for seventh course, instead of on line between 7 and 8, as was the rule below he center. It will be seen by Figs 7 and 8 that it requires two short courses above what is necessary for the length of hub; Fig 8 shows the width of these courses so plainly that I do not think it is necessary to say anything further about them except that they are to be glued down on a radial line the position of which is governed by the width of courses at the end of blade.

It is well to try the wheel three or four times when gluing up to see that the courses or joints are kept parallel with the first course laid down. If you allow them to run out of parallel lines your wheels will be crooked.

The job as it now stands will look like Figs. 7 and 8 with the courses marked x and y left off.

Now let us see what the result would be in case we had used the modification of a straight pitch, as shown by lines i k and b o. Fig 1. We will lay out the first course, using these lines. Lay off the hub as before, lay on the templet, and draw the radial line b r Fig. 8.

Measure with a pair of dividers on line, bottom of first course, the distance between

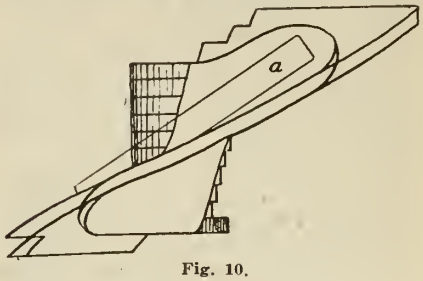


Fig. 10.

line g h and line i k; set this off on line g h, Fig. 9, toward g; then draw a straight line from end of course at r to the point just marked on g h. Again, take the distance between i k and l o. set this off toward g from the last point found of this line. Now you should have a templet the outline of which at face of bucket should start with a curve suitable for fillet and from this should run to a straight line, like Fig. 12. This is used to lay out that part of the course between the straight line at i Fig. 9, and the fillet at f, and is placed so that it touches the straight line i and runs through the point o. This point is located by the distance of curved line l, o. Fig. 1, from the straight pitch line g h, measured on the bottom line of the course you may be working. This will give us a first course like Fig. 9. From this shape the face of courses gradually approaches the true radial line until the center of wheel or hub is reached. Here, and only here, the face of bucket lies in a radial line. After passing the center the variation on line g h, Fig. 9, should be set off toward h.

On Fig 11, the face of first course is shown by broken line a and the face of eleventh course by similar line b. This you will see widens the section at g h, Fig. 9. The shape produced also offers less resistance and is

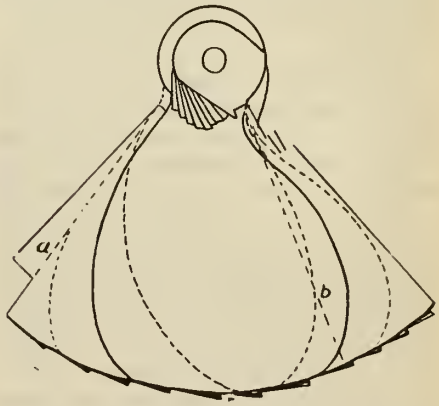


Fig. 11.

calculated to increase the backing qualities.

Now get out your adze and chop off the face of wheel. If you are as poor a hand with an adze as I am, you will need to be very careful or you will get below the surface as shown by lines on Fig. 7. Then finish up with plane and spoke-shoe, being careful to work just down to the lines formed by

face of courses, and do not leave the face all lumps and hollows, because it will not look nice to say the least.

After shaping the wheel to the desired outline, which may require the addition of more courses at top or bottom, as shown by the different outlines of Fig 11, a piece is fitted across the blade as shown by Fig. 10, and a band fastened on with screws. As this piece is intended to keep the blades straight while being molded, it should be fitted very closely and well fastened.

Now turn over and chop off the back to the right shape, after which the pattern will look like Fig. 10. Then, if you will "sharpen" the edge all around, your pattern is ready for sandpaper, and varnish.

For an increase pitch but little further explanation is required. In the drawing, or drawings, for it is better to make as many drawings as you have sections, on each drawing place a line indicating some definite straight pitch—the same pitch for all sections and all crossing the same center. This pitch line, together with the radial line made by templet, Fig. 2, is the starting-point from which each course is laid out.

Your drawings will have the general appearance of Fig. 13, in which r p s represents the increase pitch line and e p f the straight pitch.

All courses must be laid out from a radial line and this radial line must always pass through some point on line e f. This point must also be the point where the line e crosses the surface of the course you are laying out; then by measuring on the bottom line of course from e f to r b s the desired pitch may be laid out. It will be found necessary to change the bevel of line showing pitch at circumference, and the width of

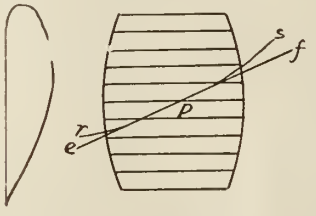


Fig. 12. Fig. 13.

course will as a consequence vary with this line. If the position of sections is located on templets it will be easy to transfer them to courses.

If you wish to find the pitch of an old propeller-wheel set up the wheel on a level floor in the position shown by Fig. 10, bringing the bored hole for shaft to a true vertical position, then draw a circle of the same diameter as wheel to be measured; on this lay off a certain part of the whole making it as large as possible, and have the end of bucket cover it. Now measure vertically from the points that mark the ends of the space laid off on the circle. The difference in the height of the edge of bucket at these two points will be to the pitch as the space is to the whole circle.

If the space is but one-twelfth of the circumferenc, and the difference in the two measurements is one foot, the pitch is twelve feet. This is only for a straight pitch.

———

Always look before stepping off the sidewalk. Never cross behind a street car without first looking very carefully for vehicles on the other track.

Making Patterns for Gearing—Rudiments

The Principles on Which Gearing Works Are Shown Before Going Into the Actual Pattern Making

IN OUR last lesson we showed two tangent cylinders revolving against each other, the one driving the other by friction. Friction is not reliable and we must add teeth while still retaining these circumferences. In Fig. 2 the circles represent the two cylinders shown in the last lesson. In the periphery of these two cylinders, as shown in Fig. 2, cut equidistant grooves.

From Brown and Sharp's works we get the following: "In any grooved piece the places between grooves are called lands. Upon the lands add parts;

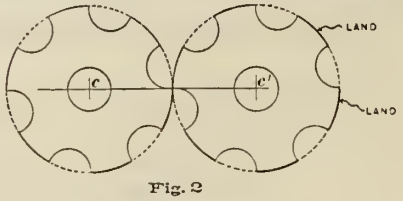


Fig. 2

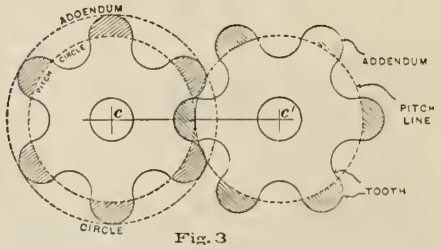


Fig. 3

Figs. 2 and 3 show the tangent cylinders shown in Nov. lesson, as they appear when converted into gears.

these parts are called addenda. A land and its addendum is called a tooth. A toothed cylinder is called a gear. Two or more gears with teeth interlocking are called a train. A line, C. C. as shown in Figs. 2 and 3, between the centers of two wheels is called the line of centers. A circle just touching the addenda is called the addendum circle.

The circumference of the cylinders without the teeth is called the pitch circle. This circle exists geometrically in every gear and is still called the pitch circle or the primitive circle. In the study of gear wheels it is the problem so to shape the teeth that the pitch circles will just touch each other without slipping.

On two fixed centers there can turn only two circles, one circle on each center, in a given relative angular velocity, and touch each other without slipping.

The groove between two teeth is called a space. In cut gears the width of space at the pitch line and thickness of tooth at pitch line are equal. In making patterns for cast gears it would not be practicable to figure down to this degree of accuracy as castings, however carefully made, can not be depended on to be perfect, and more clearance must be allowed. A useful table for laying out cast gears was published in the August number of this publication.

The distance between the center of one tooth and the center of the next tooth measured along the pitch line (see Fig. 4) is the linear or circular pitch; that is, the linear or circular pitch is equal to a tooth and a space, hence, the thickness of a tooth at the pitch line is equal to one half the linear or circular pitch of a perfect gear but slightly less than this when allowance is made for imperfection in a cast gear.

Abbreviations

In order to describe the work in succeeding lessons it will be necessary to have symbols, which will simply be abbreviations of the expressions intended. Thus: Let D= diameter of addendum circle. D^1= diameter of pitch circle. P^1=linear or circular pitch. T=thickness of tooth at pitch line. S=addendum or face, also length of working part of tooth below pitch line or flank. 2S=D″ or twice the addendum, equals working depth of teeth of two gears in mesh. F=clearance or extra depth of space below working depth. S+F= whole depth of space. N= number of teeth in one gear. η=3.1416 or the circumference when the diameter is 1. P^1 is read "P prime." D″ is read "D second." η is real "Pi," being a Greek letter of that name.

If we multiply the diameter of any circle by η, the product will be the circumference of this circle. If we divide the circumference of any circle by η the quotient will be the diameter of this circle.

The pitch point of the side of a tooth is the point at which the pitch circle or line meets the side of the tooth. A gear tooth has two pitch points.

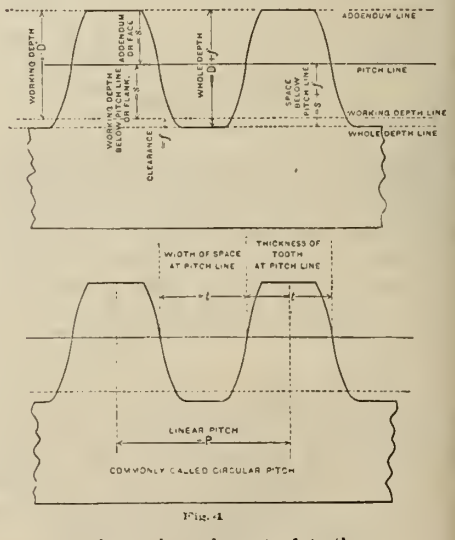


Fig. 4

Fig. 4 shows lay-out of teeth.

Core Sand Core Binders And Core Making

Price a Secondary Consideration, But Not To Be Overlooked— Molding Sand Used With Discretion Will Save Binder

CORE MAKING is a branch of the foundry-workers art which is too often looked upon as a sort of secondary consideration. In many cases it is of small importance, but this is not always the case. Like all dry sand work a properly baked core is less likely to make trouble than a green sand job, and for simple work such as a core is generally used in, very little trouble need be anticipated. There are, however, cores which require exceptional care and thought and which are liable to make trouble in spite of every precaution.

There are innumerable jobs where the core represents more work than the mold, so on the whole the core making department requires to be kept in mind just as much as any of the other departments.

There is another feature to be taken into consideration, that of costs. A lot of money can be spent needlessly in a core room by using expensive material where a less expensive material will do. It is not long since the entire supplies of a core room consisted of a bin of sharp sand and another of flour, but things have changed since then.

The core making bulletin published by the American Foundry Equipment Manufacturer's Association gives a very good general summary of the core room and its different problems. Following is what it says:—

Clean, sharp sand, that is practically pure silica sand, bonded with either liquid or dry binder in the proper proportion will make perfect cores for any purpose, but owing to the amount of binder necessary they also are the most expensive. Of course expense is a relative term and really means nothing when it becomes necessary to employ a certain grade of sand and a definite binder for a given line of cores.

Molding sand contains a natural bond and therefore the more molding sand used in the mixture the less artificial binder will be required. The objection to using molding sand is based on the fact that owing to the clay content it does not vent freely and therefore the maximum amount to use in any core sand mixture depends on the relative position which the resulting cores occupy in the mold. If they are to be entirely or almost entirely surrounded with iron it will be necessary to make them out of pure, sharp sand. If they are to be used to form parts of the outside face of the mold, covering cores, etc., they can be made from a mixture containing practically nothing but molding sand, or in some cases, old core sand. Mixtures for every purpose can be made up using any proportions between these two extremes.

It is impossible to lay down a hard and fast rule governing the proper amount of binder to employ. The amount will range in extreme cases from 1 to 10 to 1 to 100. For ordinary cores and under ordinary circumstances a core mixture made up of half and half sharp sand, also known as sea sand and beach sand, and bank sand bonded with a liquid or dry binder in the proportion of 1 to 20, will be found satisfactory. All the manufacturers of core binders are prepared to furnish definite instructions for any class of cores to any person who cares to send for them.

Another factor to be considered is the size and shape of the core. Large cores, or cores that stand high on the plates, if made altogether of sand that does not contain a natural binder, will sag out of shape during the drying process if they are not supported by outside artificial aid. These aids may take the form for driers in the case of small and medium sized cores and plates, pieces of rails; or bricks built up at strategic points in the case of large cores.

A judicious use of molding sand in the mixture, if the purpose for which the cores are intended does not prohibit its use, will help the cores retain their shape in the oven without having recourse to any form of outside artificial support.

The interior of large cores can be filled with cinders and molding sand. Time was when coke was freely used for this purpose but present day prices make it more expensive bulk for bulk than core sand and besides cinders are just as satisfactory. Except in extreme instances where the cores must be extremely strong and rigid it is not necessary to make the entire core out of a core sand mixture. All that is required in the majority of cases is to line the corebox with core sand in the same manner that facing sand is disposed against the face of a pattern. The arbors also are covered with core sand to give them a grip and then the remainder of the space not occupied by the cinders can be rammed full of old molding sand.

A uniform mixture probably is the most important factor involved in core making. Frequently the binder or the sand or the relative proportion of each is blamed for defective cores when the real reason is due entirely to the manner in which the sand is mixed. When it is remembered that the sole function of a binder is to unite the particles of sand in a compact mass it is readily apparent that if the binder is not brought into contact with each grain of sand its purpose is defeated.

The only way in which this intimate and thorough dissemination of the binder can be established is through the agency of some form of mechanical mixer. Not only does this process produce a thoroughly blended and uniform grade of core sand, but it also makes it possible to use a considerable quantity of old core sand in the mixture. Furthermore, since the binder is evenly distributed throughout the mass of sand a minimum quantity is sufficient. The impression seems to prevail in some quarters, particularly where mechanical equipment is lacking, that core sand mixers are only adapted to plants handling large quantities. While it is true to a certain extent that mechanical equipment finds its greatest field in foundries of that character, still there are few foundries so small that one of these sand mixers will not prove a profitable investment. Facing sand can be mixed as well as core sand and the economies effected by this method of mixing sand will soon absorb the cost of equipment.

Another feature in connection with core making that does not receive the recognition to which it is entitled is the manner adopted in many places for producing straight lengths of round and other symmetrically shaped cores. Sim-inexpensive machines are available for making cores of this character so true that in many cases machining the holes in the castings is dispensed with and yet you can go into almost any foundry and find core makerrs using split wooden boxes that turn out cores which are neither round, oval or square.

The importance or using perfectly flat core plates on which to dry the cores cannot be over estimated. Crooked plates will produce distorted cores and distorted cores in turn will cause delay in assembling the molds. In cases where the metal thicknesses in castings are held within very close limits twisted or distorted cores cannot be used. If by any chance they get by the inspector they will cause defective castings and be a more serious source of loss than if they had been scrapped immediately after coming out of the oven.

Many cores made in halves and dried and afterward pasted together could be made to greater advantage by providing driers to support the complete core while in the oven. These driers are employed extensively in automobile and other shops engaged in mass production, but could be employed to advantage in many cases by practically every foundry.

The slight initial cost is soon absorbed in the time saved, and besides cores made and dried in this manner are more perfect and uniform than when both halves are pasted after they have been dried.

Molding a Propeller From Single Blade

Four Separate Molds Are Made, Taken to the Oven and Dried, Returned to Their Former Location and Made Into One Complete Mold

By F. H. BELL

THE molding of a screw propeller from a complete pattern in a foundry with a crane powerful enough to handle the cope would not be a difficult proposition providing we have the cope flask made to fit the pattern, but as we pointed out in our last article this is not a likely way of making this class of work. There are few establishments where a sufficient number of propellers exactly alike will be called for to make this method profitable. For small wheels this is quite common, but we will not dwell on this class of molding as it is well understood by every molder. The method which I purpose describing is that of manufacturing (not making) high-class propellers in a profitable way, from a one-blade pattern, but to describe it in a manner such as would be done by the average news reporter on a machine shop publication is not my aim.

The seething metal being carried in cauldrons and poured down the apertures in the periphery of the cast, is amusing but not much use. The molder knows how to get the iron into the mold after it is made, but what I propose to do is to take a stove-plate molder who never saw a propeller, into a vacant room and show him how to do this class of work.

I have a dictionary at my elbow and can hunt up a lot of interesting expressions if I wish, but I don't want them. I just want to confine myself to claywash, gaggers, swab-pots and similarly familiar expressions which will be understood by the man who works in the foundry.

A propeller, as our pattern maker has explained, is a section of a screw. Any one who has ever farmed or been acquainted with farming will know what the farmer calls the mold board of a plow. Visualize four of these mold boards attached to a hub and we have a propellor. Imagine having a pattern for this mold board and making four molds frim this one pattern and then placing the four of them in the form of a cross with the ends together, and build a hub in the centre and we have a crude idea of how the propellor is made from a one-blade pattern. This is practically the method employed, but we must have a way of knowing that the blades are in the exact position required. This would not be particularly difficult if it were the intention to make a green sand mold, but a casting with so much weight in some parts and coming down to so sharp an edge is not to be made in green sand.

The blades are molded in iron flasks and taken to the oven and thoroughly dried, after which they are returned and asembled. The sand used in molding sand with some sort of binder added, unless a natural loam can be located, which will bake hard. Without any further introduction I will proceed to describe the molding. It should not be necessary to describe the spindle which is used, as it is the same as any spindle for sweeping fly wheels, etc., being a straight shaft standing perfectly plumb in a bottom bearing, and in some cases with a bearing at the top to keep the spindle from any possibility of shifting at the top and getting out of plumb. (See Fig. 1.) This spindle is marked so that it can be turned exactly a quarter turn and secured. Onto this spindle the blade pattern is fastened as shown in the illustration Fig 2-b. The flasks are similar to any iron flask, but twisted to approximately the shape of the blade, and instead of having a loose bottom board or plate, the drag part has a bottom cast to it. Some shops will have openings in the side or bottom to facilitate ramming in the sand, which openings will be closed with plates after they have served their purposes. This is not important as the sand can be rammed under without much trouble.

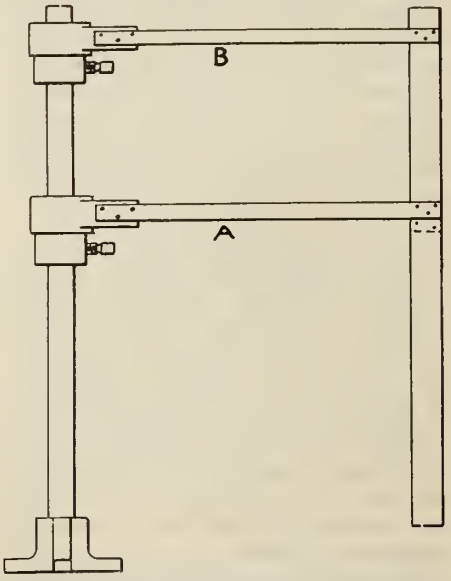


Fig. 1.—Sweep for pulley. By removing sweep arms and putting blade pattern on the spindle, it is ready to be molded.

In a well equipped foundry there will be an iron floor to the pit in which the mold is being made. This floor may have slides on it similar to those of a lathe chuck such as is used in the machine shop. The sliding parts have upright posts on them which project up to the bottom of the flask. The drag part of the flasks have lugs with bolt holes so that all four can be fastened together.

On the bottom of the drag are little sleeves into which the pright posts fit. In beginning a mold the drags are placed on these upright posts, which can be shoved in or out and which can be screwed up or down. By this means the drags can all be properly placed and bolted together. The pattern is now secured to the spindle and the drag rammed the same as would be done if bedded in the floor. No attempt is made to complete the hub as the flasks have to be taken apart and replaced on a slight twist. So long as there is enough of the hub to have a guide when finishing the mold that is all that is required. The cope is just the same as any cope and fits on with guide pins. The copes have no lugs to fasten them together. Each blade is finished as a complete unit before the next one is begun. The sand is rammed in the drag, a parting made, parting sand put on and the cope rammed up. After lifting off the cope it is put to one side and finished the same as any other cope. The pattern is swabbed and after loosening it from the spindle, it is lifted up out of the mold and swung around the next one, and lowered down onto the cooler, which makes it the right height. As we have seen the spindle is marked so the blade must be in the right place. A common way is to have holes drilled, into which pegs are placed.

After all four molds are completed and black-washed, the bolts are removed and all the molds lifted and placed on the car and shoveled into the oven. When dry each part is lifted and put back into

the exact place from which it had been taken; the upright posts which fit into the sleeves on the bottom of the drag being the guide. After bolting the drags together, the copes are put on the same as on any other molds, clamped together or bolted as the case may be. As we have already shown, no attempt was made to have a qaurter of the hub on each blade. Enough to give an outline of it was sufficient. A block of wood of

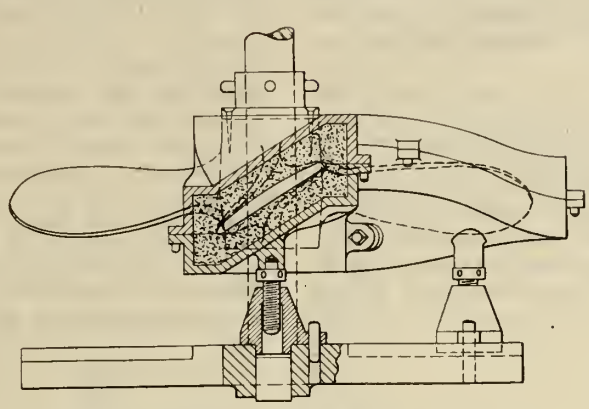


Fig. 2.—Iron base on which molds are assembled. Left side shows blade pattern. Right side shows flask.

the proper shape is now put in the hub against the space between two of the blades. This space is filled with sand rammed in tight. This is continued around the four of them, after which a blow torch or some other kind of a fire is used to dry these parts. It will be understood that the spindle and pattern were removed after they had served their purpose. Another point which I have neglected to mention was the top and bottom of the hub. These are made the same as on a fly wheel by using a core box and making a flat, round core with a print to receive the centre core.

The bottom one is really the first move in beginning the mold. It has a hole through it for the spindle, and all the flasks are assembled over this core. The top one is the same as the bottom, but has openings for the gates, if it is to be gated on the hub.

Gating a propellor is always done at the hub, but there are two ways of doing it. One is to put two pop gates on opposite sides of the hub while the other is to put the gate in the centre of the core and have four outlets down in line with the blades. The latter way is the best, because each blade receives its share, the iron entering all at the same time and going direct to the thin edge which is apt to not run on so heavy a casting.

In making a core of this kind caution must be used to guard against the core splitting from so much pressure on the inside. This can be overcome by binding it well with heavy wire, but a better way is to ram some iron rings right into the core when making it. When the mold is all bound and bolted together, sand is rammed between the blades to guard against any possibility of a run out. A runner basin is built on top and leading over to one side for convenience in pouring. Each blade, I should have mentioned, has a flow off riser to it so that the hard pouring which is necessary to make a casting of this kind run sharp will not cause it to be strained. The runner is kept full right to the finish, and then when pouring ceases the risers chain the runner.

In conclusion I would say that these are the fundamental principles involved in molding a casting of this kind, and other work besides propellors could be molded in a like manner. The iron plate in the bottom of the pit is not an absolute necessity, but it is an advantage. Some molders will depend entirely on stakes and block and wedges. If an iron plate is vised it can be made in various degrees of completeness. Screws similar to those of a lathe chuck could be used, but a straight slot in which the upright posts are shoved about will serve, and these can be made secure by any means desired. The whole idea is to get four molds in their exact place so as to get an exactly balanced propellor. Some means must be devised to place the flasks in such a way that they can be taken away and returned to the same place from which they were taken. It would be possible to dry the mold in its place, in which case it would only be necessary to place the drag part so that it would be secure, and no arrangement such as we have shown would be called for. The rest of the molding would be proceeded with in the manner here described.

Drying a mold in its place savors of building or making—not of manufacturing, but there are foundries where no other way is possible. Drying the copes is easily accomplished even though the bottom half is permanent. If no oven is available the copes can be placed with the face downward and a fire built under them.

It might transpire that a blade pattern and spindle is available, but no flasks. In this case the pattern could be used to advantage in building a loam mold complete, or a loam bottom with dry sand copes, in which case, cope flasks would have to be made. Other methods of making this class of casting include that of sweeping a loam bottom and ramming up dry sand copes, and also making a complete loam mold without any cope flasks by bedding bricks into loam and clamping them tight with iron straps. These different methods will be shown in subsequent articles.

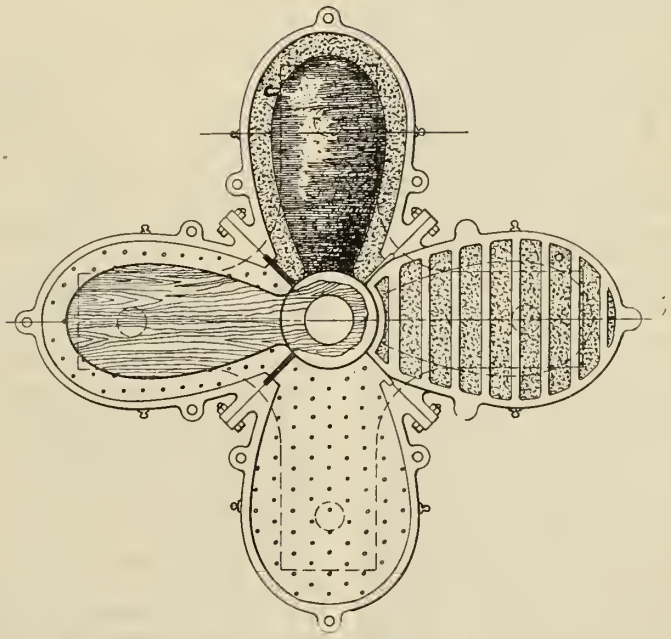


Fig 3. Lower section is empty drag, showing vent holes. Left is blade pattern in drag. Upper section is finished drag with pattern removed. Right shows cope in place.

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Don't depend on luck, because you are the Jury and luck is the Judge. His sentence may be—slight, serious, or fatal.

The Conducting Electric Furnace Hearth

The Stability of Conducting Electric Furnace Hearths Is Clearly Shown—Comparisons Between the Older Types and the Modern Furnace With Bottom Connection

By FRANK HODSON

THE increasing interest that is now being shown in the use of electric furnaces for melting up iron borings and cheap scrap and also in the use of large capacity electric furnaces for refining hot metal, again brings to the fore the advisability of intending furnace users considering the many advantages of furnaces having a properly designed and proved bottom connection. The usual cry of the manufacturer of the old type of furnace, in which all the heat is introduced over the charge is that these conductive furnace hearths are not durable. All conductive hearths are classed together whether they have steel, copper or carbon studs protruding through the hearth, or even if they only carry a neutral point and no real power. Undoubtedly the earlier types of conductive hearths, like the Girod and Snyder furnaces, with studs projecting well into the lining, gave quite a lot of trouble. Trouble was also experienced on the furnaces than ran Scott-connected with two phases only and where a thin conductive lining was used for neutral.

The modern furnace with bottom connection, of which the Greaves-Etchells may be taken as typical, is however entirely different from any of those described above and is not subject to the same fundamental disadvantages.

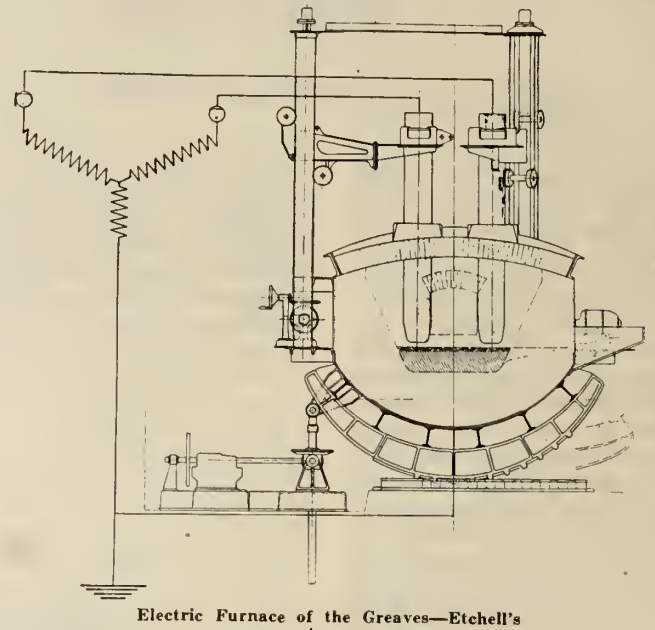
In the first place, as will be seen from diagram attached, two phases of the 3 phase power is taken through top electrodes and the third phase is connected directly to a copper plate lying underneath the lining, giving a definite source of power under the charge. No studs project into the lining and after putting a few inches of special carbon compound over the copper plate, the whole lining is rammed in of standard basic material —dolomite or magnesite, or mixtures of the two mixed with sufficient tar to bind. The lining is purposely made thick and highly resistive at the upper part where it is in contact with the charge. It is here the heat is generated by resistance, not in the copper plate which always is cool enough to touch. In drying out the lining, the tar before being burnt out helps to carry the current through and once current has been put through will continue to carry current. If the lining is kept reasonably free from slag or silicon from the roof, the furnaces will start up cold with the bottom functioning normally. In any case, even with a cold furnace only a very few minutes suffice to get bottom connection. When it is obtained, the advantages are very pronounced. In addition to the top arcs, considerable heat is generated in the charge by its resistance to the flow of current—more heat is generated by the resistance of the surface of the hearth and this is immediately absorbed by the charge in contact with the lining.

The charge comes down very evenly without the mechanical stirring or danger of burning the bottom as when the electrodes of a top connected furnace bore through the scrap. When molten, the heat generated under the charge keeps it moving slowly upwards. This slow circulation from the bottom can be seen and has many times been proved. Temperature of metal at different depths in the bath, analysis of alloy steels at different depths, all prove that slow circulation does exist. In the refining of either iron or steel, this circulation not only carries away and usefully absorbs the intense top heat of the arcs, but also brings all parts of the bath into contact with the refining slags. Sulphur or phosphorous refining and deoxidizing are therefore very rapid and thorough.

The linings are usually constructed having a depth of solid basic refractory from 20 to 30 inches, depending on the size of the furnace. As the heat generated at the top of the furnace lining is always absorbed as rapidly as made by the charge, there is no danger of weakening it. The metal comes out clean —a skull on the furnace hearth is practically unknown—no segregation of alloys on the bottom, no thickening up.

Over 70 furnaces with this resistive durable hearth are now in successful operation, and as a matter of interest I would point out that furnaces installed in June 1917 that have worked continuously with the production of thousands of casts are still in operation on the original hearth. In one of the large works here, the practice is followed of chipping out about four or five inches of the top surface of the hearths once a month and re-ramming new material in. This is done more as a metallurgical precaution to ensure clean steel— but the real linings of these furnaces have not been changed for years.

There is no doubt that a hearth of this type, having very distinct metallurgical and electrical advantages, when intelligently installed and maintained is practically permanent.



Electric Furnace of the Greaves—Etchell's type.

SAFETY FIRST

There once was an ornery guy,
Who oft made the safety man suy
As he worked he would swear
That no goggles he'd wear,
Now he's wearing a patch on his uy.
Another nut fooled with the juice
In a high voltage line that was luice,
He always was scoffin'
Now he's lining a coffin
If they must die to learn, what's the uice?

The following distances are well to be adhered to in emergency stops for automobiles. 8 miles per hour—8 ft., 10 miles—10 ft., 12 miles.—13 ft., 14 miles —17 ft., 16 miles—22 ft., 18 miles—29 ft., 20 miles—38 ft.

Operating the Cupola in the Iron Foundry—III

Proper Methods of Building the Brick Lining —How to Find the Approximate Melting Capacity Table for Use in Charging

When lining a cupola for the first time it is advisable to tamp a cushion from one-half to one inch thick between the brick wall and the steel shell. A cushion composed of one-half fire mortar and one-half burned sand from the tumbling barrels should be tamped in dry to take up the expansion. This precaution will prevent the splitting of the shell in the vicinity of the melting zone during the first few heats; or until the moisture has been dried out of the new brick and mortar. Failure to use a cushion frequently has been the cause of ruining a new cupola especially where the bricks have been laid very closely. The expansion of the new brick work has been enough to expand the sheets of the shell, split it and cut the rivets. When this happens it is necessary to place a heavy band of iron around the cupola where the flaw exists to prevent further trouble. This is an added expense to that of erection and besides the job never looks satisfactory.

Fire brick work will expand about 11-32 of an inch per foot. The cushion at the back will take care of the lateral expansion; but the corners should be cut off the bricks forming the tiers coming immediately under the angle irons in the stack to allow for vertical expansion.

The best quality of fire brick should be employed for lining the cupola up to the charging door; it is also advisable to use a double lining for the same distance. The advantage of using a double lining lies in the fact that the entire thickness of the finer bricks can be burned through before it becomes necessary to reline.

Examples of single and double linings are shown in the illustration on the opposite page and the shape and size of the brick used for each style of lining is specified. Care should be taken to have the bricks fit perfectly tight against the cushion; they should be dipped in a prepared fire mortar using only sufficient to fill the crevices.

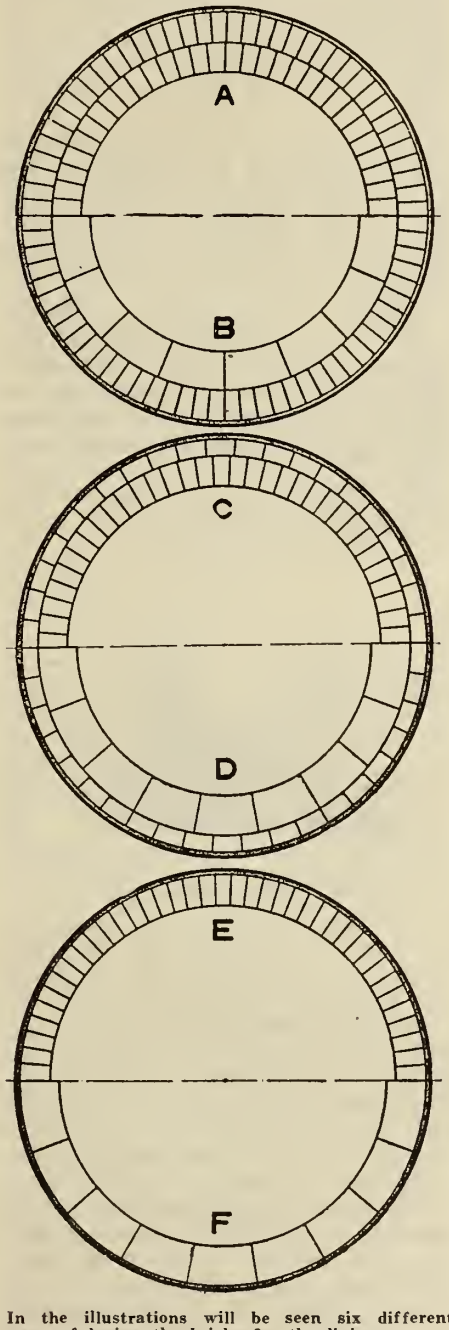
To Find Approximate Melting Capacity Of Cupola

Multiply the area in inches at the melting zone by 10 (being melting capacity of each inch area in pounds per hour) and divide by 2000 (the number of pounds in a net ton). For instance, a cupola lined down to 32 inches has an area of 804.25 square inches; this multiplied by 10 gives 8042.5 or about 4 tons per hour.

The area of any circle is found by squaring the diameter in inches, that is, multiplying it by itself, and multiplying the result by 0.7854.

The melting capacity of any cupola depends upon the design and construction, location and area of tuyeres, depth between tuyeres and charging door, manner of charging, size of charges, kind and quality of fuel, size of iron to be melted, length of heat and elapsed time between lighting the cupola and putting on the blast. All of these factors have a controlling influence on the melting capacity.

For estimating the approximate horse-power required to displace a given amount of air at a given pressure, it is customary to add 25 per cent to the net result obtained by using the following rule: Multiply the number of cubic feet delivered per mniute by the pressure in ounces per square inch (at the blower) and the product by 0.003; divide this last amount by 11.



In the illustrations will be seen six different ways of laying the bricks for the lining:—
A—Doub'e lining, arch brick 9x4½.
B—Double lining, Arch brick and cupola blocks.
C—Double lining straight or split brick 9 x 4½ laid flat against shell, Arch brick 9x4½ laid flat against shell and cupola blocks.
E—Single lining Arch brick 9x4½ or 4½ circle is used without a cushion for the stack above the charging door.
F—Single lining. cupola blocks. A cushion is used with all linings.

A copy of the following memoranda could be pasted on a card and hung up in a conspicuous place on the charging platform as a guide and reminder for the cupola men. The blanks to be filled in by the foundry superintendent.

Size No..... Maker's name.....
Dia. of shell.....in. Lined to ....in.
No. of brick in outside circle .....
No. if brick inside circle .....
Total bricks up to charging door .....

Charging

For bed use ..... pounds of coke
First charge of iron on bed .....pounds
First charge of fuel .....pounds.
Following charges of iron .....pounds.
Following charges of fuel .....pounds.
Make the last charges of fuel..pounds.

No fuel is required on the last charge of iron.

Fluxing:

Do not throw large pieces of limestone into the cupola, break them to egg size.

Spread .....shovels of stone on .. charge of iron.

Spread .....shovels on each succeeding charge. Increase the amount of flux if the fuel is poor, iron sanded, or small scrap oxidized.

Tuyeres:

See that all tuyeres are cleared of obstructions before making up the sand bottom.

Tapping:

Allow..... minutes at least after closing tap hole before drawing the first iron.

Open slag hole after.....tons are tapped.

Do not drain the cupola at each tap; keep as much iron in the cupola as practicable; it will insure clean iron.

ELECTRIC BENCH GRINDER

The Black and Decker Mfg. Co., of Baltimore, Md., announce a new model of bench grinder which is known as their Eight-Inch Electric Bench Grinder. This is a rather substantial two-wheel bench grinder driven by a three quarter horse power motor operating on either direct or alternating current. The grinding wheels extend well in front of the motor housing and are arranged to overhang the bench. This makes it possible to grind long pieces, odd shapes, etc. and also permits the wheels to be worn down to the clamp washers. The motor is air cooled with the air intake of 12 in. from the wheels to ensure a clean supply of air. Grease lubrication is used throughout. The machine is equipped with two 8 in. diameter x ¾ in. face wheels one coarse and one fine, two wheel guards, two adjustable too lrests, and electric cable fitted with attachment plug and switch.

PATTERNS AND CASTINGS

By W. P. ESSEX

Primitive Methods of Iron Making and the Development of the Modern Furnace

THE HISTORY of iron and steel making is intensely interesting, especially the later period which has witnessed the most startling and phenomenal development of any of the world's great industries.

While iron has been made, and used in various ways, from pre-historic time, the methods used for extracting the metal from this most abundant, and widely distributed of ores, were extremely crude and simple, and centuries passed without any marked improvement being made in the process of reducing the ores of iron, and what might have been to the ancients, as it is to us at the present day, the most useful and cheapest of metals, was at times more costly than copper or silver.

An incident showing the value placed on iron in ancient times, occurs in the twenty-third book of Homers "Iliad" in the discus throwing contest, at the funeral games in honor of Patroclus. The prize that the contestants strove for was an iron quoit.

Another instance which showed how highly prized was the possession of a piece of iron and its scarcity in olden times, is seen from the gaps made in the walls of the Coliseum at Rome, where the stones have been cut away by vandals in bygone days, to secure the iron clasps, which it is said, were used in the building to lock the stones one to the other, for greater security.

Early Mention Of Iron And Its Uses

It was for many years supposed, that copper and its alloys forming bronze, were the only metals known to the ancient Egyptians, and used by them for practically every purpose where metal was necessary, but explorations made some eighty years ago, under the great pyramid of Giseh, brought to light a piece of iron, which no doubt had been used at the very commencement of that gigantic work, nearly six thousand years before. Pieces of iron were also found in the black pyramid of Abas of the sixth dynasty, 3,000 B. C.

The earliest Biblical reference to iron occurs in Genesis, and in Job which follows next in order of time, there are numerous mentions made of iron, particularly Zophar's reference to the iron weapon, and the bow of steel. The iron bedstead of King Og of Basham, mentioned in Deuteronomy is interesting as it gives the size of the bed which was some length, nine cubits, and four cubits in breadth. Later in the first book of Samuel, we are given an account of the fighting equipment of Goliath of Gath, whose spear head of iron weighed six hundred shekels. From Eziekiel we learn that the Jews obtained their iron from Tarshish.

The Chaldeans, Assyrians, Phoenicians and practically all those people of the older civilizations were familiar with some method of making iron, and carried on the industry with considerable success, but their methods were extremely crude.

While the Greeks made considerable progress in the working of iron, the supplies which they used to further manufacture were mostly obtained from the Phoenicians, who had earlier discovered its source and learned the art of smelting.

The Romans made considerable use of iron in later days, but they were not

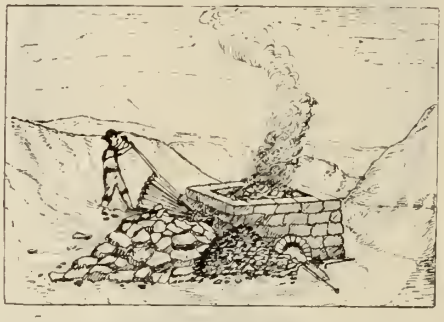


Fig. 1—The Catalan Forge.

so well acquainted with its working as some of their contemporaries, and their few hearths produced a very inconsiderable quantity of this metal.

When the Romans invaded Britain, they found the natives in possession of many iron implements, which not unlikely were the products of their own rude forges. This industry was greatly stimulated in Britain during the Roman occupation. In many parts of the country, and notably in Monmouthshire, the remains of furnaces, extensive cinder beds, and partially smelted ores have been found, which, associated with the period of Roman occupation, show that the iron industry of that time was of considerable importance.

Early Methods And Furnaces

The earliest attempts at iron making consisted in scooping out a hole in the ground, and puddling it with clay to form a rude hearth, into which was placed wood and charcoal. When this was well lighted, charcoal and ore were added, which when heated the intensity of the heat was raised, by blowing the fire by means of a mouth pipe. The result of these efforts was a small, spongy mass of plastic metal, which when drawn from the fire was beaten and hammered into the desired shape. It may not be generally known that this crude method of iron making is still practised by many of the primitive races in different parts of the world. In a recently published book by Capt. Henry Bandesson, on "Indo-China and its Primitive People" the following short description is given of the method employed by the natives in that region lying south of Eastern China and north of Siam, known as Annam, which among their many industries is included the working of iron and copper. "The iron ore is mixed with charcoal and clay in a rude retort, fired and stirred for twenty-four hours, when it liquefies in three layers, the lowest of poor iron, the upper of ashes, and the middle of a good quality of malleable iron, often worked up on a block of stone."

Other travellers in India, Borneo and Central Africa have mentioned the slow and tiresome process by which the natives of those countries obtain a few pounds of iron.

The earliest iron furnaces were little better than holes in the ground. In Ancient Britain during the Roman occupation iron was made in conical pits, which were usually dug on a hill top with a tunnel from the prevailing wind side of the hill, to the bottom of the pit. By this means a natural blast was obtained, but only on those days when the wind was blowing in the direction of the draft tunnel.

A more reliable forced draft, than that obtained by the wind rushing through a tunnel, which was altogether too uncertain led to the adoption of bellows, probably first made from the skins of animals. These are the earliest contrivances for producing currents of air, and are still used in some parts of India. A picture of these curious devices is shown in an illustration taken from an Egyptian wall, on which the picture had been chiselled possibly thirty-five centuries ago. These early blowing devices which look like bladders. were arranged in pairs and pedalled. The illustration shows a man with two goat skin bags,

one under each foot, these are both connected with the pipe that leads the air to the forge. When one skin is full of air, the operator puts his weight on that foot and forces the air into the pipe leading to the fire, when his weight is removed from the other skin he pulls a cord which refills it with air through a hole in the top of the bag, which when filled is closed by the operator's bare heel, his weight is now shifted to that foot, and the air is expelled through the pipe as before. The first skin is now being filled by the same process, and as the bags alternately are filled and exhausted, a fairly continuous blast was possibly obtained.

The invention of the bellows valve in the fourth century which would automatically open and close with the rise and fall of the bellows, made possible a blast of greater volume and power than had heretofore been obtained, especially when operated by wind or water power.

The Catalan Forge

For a thousand years or more the Catalan forge was the most important and effective contrivance used for the

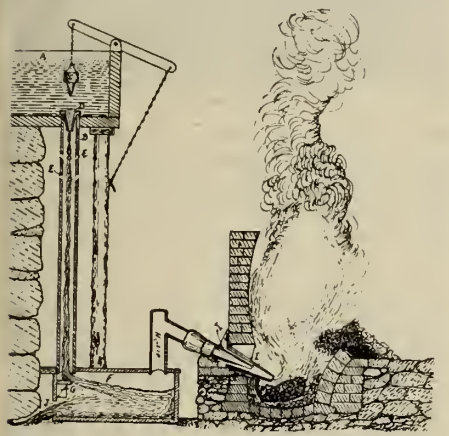


Fig. 2—Water Blast or Trompe and Catalan Forge.

making of iron and steel. It is supposed to have originated in the Pyrenees, where even to this day in remote districts it is still used. And in some form or design it has been known and used wherever the iron industry has been carried on. In its simplest form as shown in Figure 1 it consists of rough masonry in which was made a rectangular hearth of stone tapering slightly to the bottom, and supported on a stone arch. The hearth was lined with refractory blocks and clay, and the bottom, slag mixed with sand, on which charcoal was spread, and lighted, the hearth was then charged with charcoal and roasted ore. The blast was furnished by a hand operated bellows through a tuyere at the side of the hearth.

An ingenious blowing device that was later used when a sufficient supply of running water was obtainable for its operation is the water blast, or trompe shown in Figure 2. The drawing illustrates the water blower as applied to the hearth of a Catalan forge. The water in the elevated tank A enters the pipe B, its flow being regulated by dropping the weighted plug C into the mouth of the nozzle D. The water in falling through pipe B draws in air through the holes EE, is carried downward to the receiver chest F. The fall of the water is broken by striking the shelf G. The accumulated pressure in the receiver forces the air into the pipe H, and through the tuyere I to the hearth,the water escaping through the opening J in the bottom of the receiver.

In operating the forge, lighted charcoal was spread over the bottom of the hearth, over this was placed charcoal to the height of the tuyere. When this charge was thoroughly ignited, a sheet of iron was placed vertically across the centre of the hearth. On the side of the fire opposite to the tuyere small pieces of roasted ore were piled and the tuyere side of the hearth was filled up with charcoal. When the blast was in operation the iron sheet was raised, and the heated gases attracting the ore reduced it to iron and slag which dropped to the bottom of the hearth, where it was drawn off.

The furnace just described represents, possibly, the furthest advancement made in the iron smelting industry up to the thirteenth century, and the ancient ironmaster and smith has good reason to be proud of the products of these rude forges, if the stories told of the excellence of their steel is founded on fact and not imagination.

The Stuckofen And Blauofen

An improvement on the Catalan forge which followed later was the Bloomery furnace, which while operated in much the same way was run continuously. Closely following came the German stuckofen (Stack oven) or high Bloomery. The stack furnace marks the first departure from the shallow hearth type of furnace, which had been used for making iron from time immemorial. The shaft was built of masonry to a height of about fifteen feet, with an inside diameter of about three feet at the hearth, with one tuyere. A hole was provided for running off the slag while the iron which collected on the bottom in a pasty lump, was withdrawn from the tuyere arch, which was bricked up when the furnace was working. In operating, lighted charcoal was put on the bottom, then charcoal and ore, after the blast was started, charges of charcoal and ore were added till the furnace was full, this was kept up until sufficient iron had been melted, which was drawn off as before described, and the furnace allowed to cool.

The Stuckofen developed into the Blauofen (Blow oven) or blast furnace, which as a charcoal furnace was first used in Siegerland, Germany, in 1500.

With improved bellows of the double type and operated by water power, a more continuous blast, and of greater volume was obtained, which made it possible to raise the heat in the furnace to a point sufficient to liquefy the iron. And for the first time in the history of iron making, the casting of iron was made possible.

It is generally supposed, that the first cast iron was made in Germany, although some authorities claim that Belgium should be given the credit for it.

These early blast furnaces were generally built on the side of a hill, for convenience in handling the fuel and ore, which was wheeled across a bridge connecting with a platform made on a level with the furnace top and dumped in. An early American furnace of this type is shown in Figure 3.

Later Developments

Space does not permit, nor is it necessary in this article to mention but a few of the progressive stages of development, from which evolved that wonderful fabrication of iron, steel and masonry, "The modern blast furnace."

In 1713 Darby succeeded in using coke as a blast furnace fuel, and by 1740 charcoal was practically abandoned in England.

The introduction of the hot blast, the invention of James B. Nelson, in 1828 resulted in an immense saving of fuel.

In economy of operating, possibly the greatest improvement made in the blast furnace resulted from the various methods devised for the utilization of the furnace gases, which effected a still greater saving in fuel. Among the many improvements made, not the least in importance are the various types of mechanical blasts which have aided materially in the development of the blast furnace. The simple rotary fan and the

Fig. 3—Old American Iron Furnace, Built in 1880.

blower engine have given way to the more powerful and efficient types of centrifugal and rotary pressure blowers. The result of each progressive step has been an increase in the quantity of the blast, and a greater economy of power in operating. It might be said that no single invention in the history of iron making, was more important to the industry, than the mechanical draft, for there is little doubt that failure to melt the iron, in the earlier attempts at

smelting, was largely due to insufficient draft.

The Cupola Furnace

There are several designs of foundry cupolas, all operating practically on the same principle, but differing slightly in detail. The cupola is a simple type of blast furnace, on a smaller scale, in which is re-melted the product of the blast furnace, for making the iron into castings of various shapes and sizes. Many attempts have been made, to make castings of iron or steel direct from the melting furnace, and eliminate this secondary melting, but these efforts have not given any great promise of success until very recently. During the past two years metallurgists and engineers in the employ of that industrial wizard, Ford, have been engaged in developing and perfecting a process that will accomplish this end, and their efforts would seem to be highly successful. At the River Rouge plant of Ford Motor Co., which promises to be the greatest iron and steel plant in the world, the first successful attempt has been made to incorporate the three most important divisions of the iron industry, the blast furnace, foundry and steel mill into one smooth working organization, and for the first time in the history of iron making, to successfully make castings direct from the blast furnace with one melting.

At the River Rouge plant, when the smelting furnace is tapped, the iron runs into a channel made in the sand floor. From off this main channel, about halfway in its length is a wider and shallower channel, into which the slag is diverted, while the molten iron continues on and is caught in an immense pot mounted on wheels, and on a track. The pot when filled is hauled by a locomotive to a mixing furnace, where the iron is treated with certain alloys, which give it the necessary qualities for the castings for which it is intended, the metal is then poured into smaller ladles, which are mechanically operated, and drawn to the foundry. An endless chain conveyor brings the ladle, an operator pushes a lever and the metal pours into the mold which continues on to the floors where the casting is removed, and the flasks shaken out. The methods and proce ses employed in this plant, are said to be the last thing in scientific foundry practice.

These newer methods which are usually improvements on existing systems, are not developed in a day, but are the result of long and patient study, many experiences, disappointing failures, and persistent effort. The electric furnace for iron melting, to which our attention has for some time been directed, owes its origin no doubt to the electric arc furnace, patented by Sir William Siemens in 1878, but only within the last few years has its use become at all general, and during this period only in the steel foundries. From the standpoint of economy in operating, it cannot yet compete with the cupola and coke in the grey iron foundry, but it no doubt has some advantages over the cupola, as it is claimed that a fair grade of iron can be made in it from low grade iron, cheap scrap borings.

Iron Garden Tools From Ancient Boscoreale

A Rake and a Sickle of Practically the Same Designs as Are Made To-day. Part of Wooden Handle Preserved

By F. H. BELL

DURING the last few months I have endeavored to interest the readers of this publication in some really interesting foundry work which was done about two thousand years ago, and which was buried beneath several feet of earth at the time of the eruption of Mount Vesuvius in the year 79 A.D., and just recently unearthed. It is, of course, impossible to give any intelligent information on how the work was done or what facilities the foundrymen of those days had for doing it, so from a truly technical standpoint the material is of little use, and any further articles on the subject will, of necessity, be more or less a repetition of what has been shown and are not advisable, although there were some complicated molding and pattern-making features which showed that the ancient workman had to be a practical mechanic. There is just one more point I want to dwell upon for a short time and I will conclude my story of the Ancient Romans and their metallurgical ability—that of agricultural tools.

It is not an uncommon sight in the advertisements of our modern manufac-

Iron Rake taken from Villa Rustica. Badly corroded, but showing that iron was used.

turers to see illustrations of how work was done one hundred years ago and among the pictures will be that of the roots and branches of trees improvised into some sort of a plow and being drawn by a couple of cattle. We are told that this method is still in vogue in some parts of the world at the present time. This may be true but the illustrations here shown of garden tools which were made in the first century would indicate that they had that branch down about as fine then as now. They also show that iron was used then and that tempered copper and bronze of different kinds were not the only metals from which tools could be made. The sickle and rake are only two of the many. Everything in the way of tools which a hand gardener would have today, was there. The iron is much rusted and covered with accretions of small pumice-stone. Of the wooden handles traces still remain, although there are suggestions advanced that perhaps this is the remains of the wooden boxes in which the tools were kept. This is a very unlikely supposition, for the reason that the rake shows that it was in a dilapidated state before it took its long rest, and it is highly improbable that it would be carefully laid away in a wooden chest. The rake is 12½ inches in width and has six prongs, some of

The sickle would likely be some brand of steel or hardened iron.

which are badly bent as though having been used for breaking lumps of hard ground. The sickle blade is 20 inches in diameter and is in fair condition judging from outside appearance, although badly corroded. The actual amount of iron which remains inside of the corrosion would be difficult to ascertain without ruining the sickle for museum purposes. The design, as will be seen, is the familiar design of the present day sickle, which, while somewhat out of date for farming purposes, was the only known tool for cutting grain and hay less than one hundred years ago.

In addition to the bronze furnishings which have been shown in former articles and the iron tools here shown there were also some silver pitchers and other silverware which showed interesting foundry work. The fresco work and the terra cotta was, of course, in most prominence and would be of most interest to lovers of antiquity, but being out of the foundry field is not described.

Every man should be a Committee—of one— to prevent accidents. After an accident, we can always see how it could have been prevented. Talking safety does no good unless we act safely. Our duty to the public is to protect the public. Every man who runs an automobile, should run it as a safe one—safe for the public and safe for himself. When other users of the streets are careless, he must be doubly careful.

Three causes of accidents around moving machinery, are—gloves, loose sleeves and flowing neck-ties.

Some Perplexing Grey Iron Foundry Problems

Effects Produced on Molten Iron by the Introduction of Oxygen and Other Foreign Matter. Views of Different Authors, Widely Divergent

By J. SHAW

I SHALL be pleased if you will look upon the following statements as the introduction to a discussion, rather than as a paper in the usual sense.

It is quite difficult to reconcile the various views put forward by authors concerning some phase of our work.

Reference was made last year in Professor Andrews' paper to the bad effect of oxide inclusions in cast iron. This year Mr. Elliot mentions the same fact. Yet there are eminent metallurgists who deny that any oxide can be present in an iron containing over 0.3 per cent. silicon, and those who state that oxide is beneficial to the iron and actually blow air into the metal to improve its quality.

Pickard in his Carnegie Research (page 76, Carnegie Memoirs, 1916) states: "The chief interest attaching to the results is that they show that oxygen is present in material from which it has usually been assumed to be absent; and that an amount of oxygen which would be important if found in steel may exist in material containing even such comparatively large amounts of silicon (0.699 per cent.) Carbon (3.24 per cent.) Manganese (0.53 per cent.) as commercial cast iron (0=0.021 per cent.)."

Dr. Hatfield ("Foundry Trade Journal," August 20, page 620), during a discussion gave it as his opinion, "That if there was more than 0.3 per cent. silicon in the iron, that iron was free from oxide." A liquid iron containing, say, 1.3 per cent. silicion, 1.0 per cent. phosphorous, and 0.6 per cent. manganese was one which J. E. Johnson, Jnr., said might contain oxygen. But he (Dr. Hatfield) said quite definitely such iron could not contain oxygen, because the silicon, phosphorous, and the manganese had a much greater affinity for oxygen than the iron in which they were dissolved, and the result was that, before the oxygen could form oxide of iron and so be dissolved in the iron, it would form oxides of those elements, which would come to the surface, and so be eliminated from the iron, by specific gravity alone."

Elliot's view, viz., "That oxides do exist in cast iron in appreciable quantities, but that their action is detrimental," is held by many people, including P. Munnock (B.F.A. Proceedings, 1903), Houghton (B.F.A. Proceedings, 1908, page 44). Professor J. Porter (Foundry, October, 1912) and Dr. Moldenke (Principals of Ironfounding). The last authority states, "This problem can undoubtedly be traced back into the blast furnace. It is perfectly possible that the difference between a pig-iron, which shows superior strength on being broken and another of the same composition, which breaks readily, lies simply in the percentage of oxygen retained in passing through the reduction from ore to metal, or more likely in a slight re-oxidaton of the melted iron sponge as it passes by the tuyere zone of the blast furnace.

"When it is remembered that with apparently identical compositions, there are definite qualities inherent in various brands of cold-blast and warm-blast charcoal-irons, as also in hot-blast coke irons, which manifest themselves in greater or less strength, machinability and fineness of structure, there must be a reason for this situation other than a mysterious agency or hereditary ore qualities transmitted to pig-iron (the view still held by many old-time furnace and foundrymen). This reason, the author has for many years claimed to be the extremely small percentages of dissolved iron oxides in the several classes of pig iron in question."

J. E. Johnson, Junr. (Foundry Trade Journal, April, 1914), (A. F. Association Proceedings, 1914), and Wilford L. Stork, (Foundry Trade Journal, July, 1919), go a step further and state that oxide not only can exist in iron containing 1.88 per cent. silicon, but that its effect is beneficial.

Johnson states, "That in the course of an investigation extending over two years and carried on by means of physcial tests, remelts, photomicrographs, and direct determinations of oxygen, we found that all abnormally good irons contained oxygen to the extent of 0.04 to 0.10 per cent. that the normal charcoal irons contained 0.015 to 0.025 per cent.

We went further, and put oxygen into normal and poor irons by remelting them with a highly oxidised product made only when the furnace had been in trouble and was working too cold to make merchantable iron. By this means we made iron as strong as the best the furnace ever produced. We also tried weakening these strong irons with deoxidisers, and whilst we could not get out very much oxygen, we reduced it enough to reduce the strength."

The above quotations put very briefly the various views held.

My interest in the question dates back about 15 years, when I had charge of a foundry connected with a firm who owned blast furnaces. This furnace was often on a forge-iron burden, and any iron too grey for forge purposes was transferred to the foundry side. Often when the grey forge-iron was melted in the cupola, the resultant metal in the ladle showed a curious visible phenomenon. When the ladle of molten metal was skimmed off, and the usual oxide film covered the surface of the metal due to its contact with the air, there appeared under this film spots which immediately spread to the size of a shilling. There appeared to be some chemical reaction taking place accompanied by heat, because these spots were of a higher temperature than the surrounding metal. If the ladle was allowed to stand for a time, as the temperature of the metal dropped, the spots turned black as they came to the surface and spread out. If the oxide film on the top of the metal was now pushed aside, these black patches could be taken from the top of the metal, and would have the appearance and composition of hammer scale.

It must be borne in mind that during the reaction, if such it was, the top oxide film was not broken, nor did any flame appear as is usal. This phenomenon was of such common occurrence that all the moulders recognised it at once. Their trouble was that no matter how hot the metal was melted, it lacked life when run into the moulds, and short cold-shuts on the top side of the castings often showed under the water test.

Taking it for granted that oxide inherent in the iron as received from the blast furnace was the cause, I made small additions of finely powdered 80 per cent. ferro-manganese down the spout of the cupola as the metal was tapped. This stopped the appearance of the spots at once, and the resultant metal was more fluid. The small additions of ferro-manganese had not altered the composition of the metal so far as an analysis showed. It is stated that an increase of oxygen adds to the depth of chill. It should be pointed out, however, that if small amounts of aluminum be added to the ladle there is a decrease of chill. Whether this is due to its deoxidising effects, or to its action on the carbon, acting to some extent similarly to silicon, is a moot point. I think oxygen does strengthen cast-iron, causing the graphitic carbon to be present in a finely divided state, but also agree with Elliott that its lack of life and tendency for blow holes, etc., make it undesirable under cupola conditions. At the same time, it must be remembered that Johnson took his metal direct from the blast furnace, and thereby obtained that amount of superheat in his metal that might overcome these troubles.

The next point I wish to emphasise is the great discrepancy that often occurs between the physical properties

of cast iron and its chemical content, even when the iron is from the same ores and furnace.

That there is a difference between irons of the same composition when made in a cold-blast charcoal furnace and a hot-blast coke furnace, for instance, is now generally conceded.

It should not be taken for granted that the above statement implies an attack on chemical analysis; no one sets a higher value on its use than the speaker, but it is a warning that with the use of faster driven furnaces, the use of small ore and often poor fuel, there probably is on the market large quantities of pig-iron whose physical tests would not be what one would expect from the chemical analysis. Most of us remember the series of tests made by Cook and Hailstone (Proc. 1908 and 1909), in which the lowest results of one set were higher than the best in the other set, although the chemical analysis agreed within practical limits.

Pilkington (Proc. 1905 and 1906), in speaking of what is known as "Over Grey" pig, states, "The fracture when cold is a very wild and scattered one, and would in all possibility be graded as a No. 4. The analysis would be equal to a good No. 1 (see below). If the usual amount of scrap that a No. 1 carries were melted with this iron in the cupola, the resultant casting would be very much harder than usual; in fact, in many classes of work it would give trouble. It has been said that whatever may be wrong with the pig-iron in its carbon, that when re-melted, that carbon is all restored to its normal condition in the casting. It does not appear possible to controvert such a statement, but the class of iron just referred to is not restored to a normal condition, and I am afraid is little known to metallurgists."

Houghton in a paper the following year confirms the above statement. He also gives the analysis of one of these "Over Grey" pig irons, which is as follows: T.C. 3.53 per cent., G.C. 2.95 per cent., C.C. 0.58 per cent., Si. 2.94 per cent., S. 0.007 per cent.

Munnock (Proc. 1908), in reply to a statement that in 99 per cent of cases the composition agrees with analysis, answers, "I can hardly agree to 99 per per cent." Adamson (Proc. 1906), gives us a large number of examples where the fracture bears no relation to the chemical content, one of which, supplied to him by Sir R. Hadfield, had the following composition: T.C. 3.28, G.C. 2.22; C.C. 1.06, Si. 0.35, S. 0.026 per cent. Yet the fracture was grey.

Personally, I can substantiate Pilkington's remarks re "Over Grey" pig-iron, having used large quantities. There is no recovery of structure on re-melting, that would be expected from the analysis. Perhaps the most curious example of this non-recovery was one that occurred when our furnace was aiming for a low-silicon iron, with about 1.0 per cent. manganese. One cast of about 25 tons had this remarkable analysis: G.C. 3.15 per cent., C.C. 0.54 per cent., S. 0.035 per cent., P. 0.44 per cent., Mn. 0.97 per cent., Si. 0.18 per cent. Yet with this Si. of 0.18 per cent. the iron was perfectly grey. The whole 25 tons was re-melted and cast into shell containers. These were machined all over inside and out.

The containers gave excellent results, averaging over 900 shells each. So there could be no doubt about the analysis I carried pieces of this pig-iron about for some time to various meetings. The contents were checked at least six times by competent chemists, one of whom melted down a portion in a crucible, and cast plates ¾-in. thick, which were perfectly grey.

Now, I grant at once that the above iron and also those mentioned by Adamson are freak irons, but what of the large quantities of iron where the divergence between the fracture and the chemical analysis is not so marked? Would not this alone account for many of our physical test failures when the analysis seems quite satisfactory?

The third point relates to the lack of uniformity and lax manner of stating the results of tensile tests. With regard to this matter of tests, our whole criticism has been destructive rather than constructive. We, as an institution, have not submitted our views in a concrete form for the consideration of engineers and metallurgists. It is, no doubt, due to this lack of definite proposals that we, as an institution, have not participated in the preparation of British Standard Specifications in which cast iron is mentioned. Candidly, I believe it is our own fault. What are engineers to think when some members are boasting that they are obtaining tensile tests up to 21 tons per square inch, whilst many others have difficulty in reaching 10 tons? In many cases this is due to the great variation in the diameter of the tensile bar as cast, as much as variation in composition.

Whilst at the Ministry of Munitions I had a unique opportunity of investigating this question. I found tensile bars varying in the breaking portion from approx. ⅜-in. diameter (quarter-inch square) to 1.128-in. diameter (1-in. square) in use. Having received reports from another department of abnormal tensile strengths being sent in by several firms (up to 20 tons per square inch), I found in each case the small bar was in use. On another occasion, whilst a committee was sitting to draw up specifications for certain castings, it was urged by some members that in order to obtain the necessary resiliency for this type of work a tensile strength of 17 tons was needed. As these members were most successful with this class of job, their recommendation carried much weight, and 17 tons was provisionally accepted for the test. But when learning that these results (17 tons) were obtained on a bar less than the B. S. C. tensile test-piece (which was the one adopted for this specification), is was decided that 24 test bars of each size were to be made and cast from the same metal. The result was that, whilst the smaller bar still went up to about 17 tons, the ⅞-in. diameter bar turned in the centre to .654-in. diameter fell to about 14 tons. Most of you will remember the example given by one of our presidents. An inspector objected to the high tensile strengths he obtained being so much above the specification. Knowing the mixture was most suitable for the work in hand, the diameter of the cast bar was increased, then turned down to the same size as before. When broken, it gave three tons less and met the objection raised.

It would be easy to multiply these examples, but sufficient has been said to show us how vital the matter is.

There are two ways of facing the problem, which is not the easy one it at first seems. Either to have three different sizes of bars to match the composition of light, medium and heavy castings, or have one diameter of bar with specified tests varied with the thickness of the casting the test bar represents. The first has been tried by both America and Germany so far as the transverse test is concerned. Whilst there were distinct theoretical and practical advantages in having the size of the bar to bear some relation to the thickness of the casting it represents, its use was found so cumbersome in work that it was dropped.

At the International Society for Testing Materials meetings in 1913 a standard bar 1.2-in. diameter tested on supports 18-in. apart was provisionally adopted for international trading purposes.

The great objections to the American Standard Specifications are, firstly, that 12-in. centres are too short to register fine correct deflections on a 1¼-in. diameter bar; secondly, if 21,000 lbs. represents a fair test for castings varying from ¾-in. to 1¾-in. thick, we should expect the test load for 2-in. castings to be less per square inch, instead of the higher figure given in the specifications. It stands to reason that if the mixture was made to give the maximum strength at 2-in. thick and over, it would be too hard for a 1¼-in. round bar, and a drop in strength would result.

I do not think it the best policy for the Institution to issue specifications of their own. We have a British Engineers' Standards Association who would be only too pleased to have our direct co-operation. Many of us feel that unless the foundrymen put up some definite proposals to meet this problem, it will continue to be done for them in a way that does not meet with their approval. There is no doubt that proposals from us would meet with a very good reception from the Standards As-

sociation who would probably co-opt members to state their views.

The last point, and one which will meet with much opposition, is this—I do not think, so far as cast iron is concerned, that the tensile-test is as good as the transverse-test is, as a measure of the quality of the iron. The tensile-test is more a measure of the structure of the iron, rather than its quality. Put another way, there is no difficulty in conforming to the tensile strength of 9 or 10 tons asked for on a 1.128-in. diameter bar with any common iron, if the combined carbon is about 8 to 1 per cent. according to the composition. But it is most difficult to obtain 28 to 30 cwts. on the 2-in. by 1-in. by 36-in. centre bar with the same common mixture.

Whilst there is some truth in the statement that the moulding and running of these long transverse bars add to the risk of obtaining regular results, this does not meet the whole case. From a log, in which we recorded many thousand tests, covering a number of years, it was curious to note how regular were the results of the tensile-tests, and often how irregular were the transverse-tests. It was almost possible to form an opinion of the burden of the blast furnace during certain high and low transverse-test results. Perhaps a further illustration will help. If we found the iron from the cupola was not up to the transverse-test, it was possible, by adding one pig of a No. 5 high-class iron to a 20 cwt. charge, to raise the transverse test one cwt. Add two pigs to each charge—a further cwt. on the test would be gained. A third pig to each charge would lift the transverse test up to 3 cwts. The tensile strength would certainly rise a little, but nothing like the eight times the transverse, which is a rough calculation for the 2-in. by 1-in. by 36-in. bar.

There are so many side issues to the points I have raised that may lead nowhere, yet hinder us from forming any definite conclusions, that I should consider it a favor if the following speakers would confine their remarks as far as possible to the heads enumerated below:—

(1) Can oxygen be found in appreciable quantities in an iron whose chemical analysis would mark it as suitable for making strong grey iron castings? If so, is it beneficial, or otherwise?

(2) From the examples cited in the paper, it is evident that in some pig iron, even on remelting, the fracture does not conform to what might be expected from their analyses. Granting these cases, is it not possible that large quantities of pig iron possess these inherent qualities in a lesser degree? May not this account for some of the divergent results met with between physical tests and chemical composition?

(3) Is it not in the best interests of this Institution that some Standard Specifications should be put forward for consideration of the B.E.S.A. so that the various tests might be comparable?

(4) In view of the fact that America, Germany and Italy have adopted the transverse test as a standard, with the tensile in most cases optional, is there any evidence that the transverse test for cast iron gives a better idea of the quality of iron, rather than the tensile?

(5) Would not a circular bar as adopted by the International Society for Testing Materials, cast vertically and drysand, overcome some of the difficulties of moulding and running, attributed to the 2-in. by 1-in. by 36-in. bar for transverse tests?

ASTRONOMY AND THE FOUNDRY

By A. S. Tronomer

In the November issue of this paper I presented a small article on astronomy and accuracy, which might seem out of place in a foundry, but I think that both subjects have a bearing on the subject of foundry work. In the present article I want to point out to the reader a few things about astronomy which should interest him. Molding is not the only subject which interests a molder, but still in a foundry we must keep within the limits of the metallurgical field. Astronomy as I pointed out in my last paper is not a lot of guess work but is an extremely accurate, scientific study based on well proven facts. Our earth would be part of the astronomical study of the inhabitants of another planet if (which is one of the things we cannot prove) the other planet happens to be inhabited with beings of a similar type of intellect to ourselves. We know what our earth is composed of on the surface, at least, and we have reason to presume that the other heavenly bodies are composed of the same material. This has also been pretty well proved, and it is this proof that I propose to dwell upon in the present article. Every human being who raises his eyes above the ground has seen what are commonly known as falling stars. There can be no such a thing as a falling star. The stars which we see in the sky are suns, the same as the sun which supplies us with heat and light, and they are supplying light and warmth to the planets which revolve around them. The so-called falling stars are what are correctly known as meteors, and while it is not possible to prove by any other means than circumstantial evidence, it is a well accepted conclusion that these meteors are portions which have broken away from some other planet or sun and are being attracted by gravity to our earth, It may not be realized that this earth travels two million miles every twenty-four hours in its yearly trip around the sun, and that this figures down to a good many miles every time a watch ticks but such is the case. The other planets, comets, asteroids and meteors travel at similar speed and all have attractions for each other, but their momentum keeps them on their course and they keep going around and around over the same course throughout the ages. If an explosion should take place in a comet, for instance, similar to the one which took place on the island of Krakatoa in the year 1883 when dust was blown seventy miles above the earth where it remained for years, and this explosion should throw a solid body in the opposite direction to that in which the comet was traveling, the comet would continue on its journey and leave the separated particle to go its way, until some other body such as an earth would come along, when the attraction of the earth would be greater than the momentum of the small body could resist and they would have to come together. This small body will come to earth at a speed of possibly from twenty to thirty miles per second. If it should strike our atmosphere at one hundredth part of this velocity the friction would instantly heat it to a red hot state, so it will be readily understood how hot it would be after traveling through our atmosphere at such a terrific speed. Of course the atmosphere would check its speed quite a bit but this would not prevent it from becoming heated to above the melting point before it came to earth. In fact it would be a long way above the melting point on the surface, but having but a few seconds to travel through the atmosphere a large chunk would melt on the surface and be still cold inside. This would be hard to prove in the case of an iron meteor but with stone ones it has been proved. It might seem strange that meteors are either stone or iron. The iron ones are usually considered as pure iron, with sometimes a certain amount of nickel which is in reality of the iron family. Platinum is also sometimes found in them. Undoubtedly the meteors contain other metals, but the metals which melt at a lower temperature than iron can not survive but are consumed before reaching the ground. Carbon which is found in earthly iron is also in the meteors, which have hitherto been considered as pure iron, but this carbon has been subjected to such a terrific heat that it has been converted into pure diamond. A meteor of ordinary size burns to dust before it can get to the ground but a very large one while wearing away rapidly will still have some of its substance intact when it strikes. Museums usually have samples of these, but there is one example of an enormous one which buried itself in the ground and which was distributed over many acres of territory. Space will not permit of going into details, but in the next letter I will describe this one which should be of metallurgical interest as it is almost pure iron and miniature diamonds.

Fire prevention is better than fire fighting so don't be careless with fire.

The Casting Of Aluminum And Aluminum Alloys

Various Formulae Brought Out in America and England Since the Outbreak of the War, and to Considerable Extent as a Result of the War

By ZAY JEFFRIES

THE FOLLOWING paper by Zay Jeffries, director of research laboratory, Aluminum Casting Company, Cleveland, and presented by him at the meeting of the American Society of interest but it is doubtful. Micrago at St. Louis, Mo., covers the ground of the Aluminum foundry in a very complete manner. The micrographs which accompanied the paper might be of interest but it is doubtful. Micrographs are valuable to the man who is doing the experimenting and they might be of some value to the man who intended to follow up the experiments, but to the average foundryman the results of these experiments are all that are asked for. The micrographs are simply photographs of the fractured metal magnified to 250 times its real size. Usually we show the micrographs but to the average man there is no difference between the appearance of the grain of aluminum and that of cast iron, so on this occasion we will omit the micrographs. The clear manner in which everything is explained will be of real interest to the reader.

In his paper the author first gives particulars of the various aluminum alloys used for casting purposes. He then deals with the metallography and physical properties of these alloys, following which are notes on maximum and minimum weights, tolerances on dimensions and machining data. Later sections deal respectively with heat treatment, ageing, effort of thickness of section and rate of chill on physical properties of aluminum alloys, fatigue resistance, special places where the use of aluminum castings is indicated by reason of their lightness and ease of machining, and with the selection of alloys for special purposes. Editor.

The aluminum-castings industry can hardly be said to be more than fifteen years old. It is true that castings were made prior to 1905, but in such small quantities as to be insignificant in comparison with the present magnitude of the industry. The annual production of aluminum at the present time is about three hundred million pounds. The percentage of this used in castings is not definitely known, but it is estimated at about one-half the world's production. While the automotive industry uses the bulk of the aluminum castings, there is hardly an industry of any importance that does not use some. These castings find their way into many homes in the form of kitchen utensils, vacuum-sweeper parts, etc. The use of aluminum castings is increasing rapidly in the electrical industry.

2 The aluminum-castings industry was developed largely in brass foundries and even to-day it will be found in many instances that companies manufacturing aluminum castings also manufacture brass castings. Rule-of-thumb methods have been followed in developing the aluminum-casting industry and even as recently as 1917 the quality of castings was so uncertain that aeroplane manufacturers and aviators had to be reassured of the reliability of the metal for aeroplane construction. In May 1917, at the request of Messrs. Manley and Cardullo of the Curtiss Aeroplane Company, an investigation was made of the properties of aluminum castings then being used for aeroplane crankcases and other parts. It was found that the quality was very poor, the physical properties being neither uniform nor sufficiently high.

3 Immediate steps were taken to introduce technical control in the foundries to insure against wrong metal compositions and abuse of metal during the melting operations, and also to insure the maintenance of the proper pouring temperature. The results were very satisfactory, as is evidenced by the production record of Liberty engine castings in which a minimum tensile strength of 18,000 lb. per sq. in. was specified and the rejection for failure to pass specifications was practically nil. Even in such highly stressed parts as those in the Liberty engine, no failures of aluminum castings in service have come to the author's attention.

Aluminum Alloys for Castings

4 The principal aluminum alloy used for castings in the United States consists of about 92 per cent aluminum and 8 per cent copper and is generally known as Aluminum Company of America's No. 12,alloy or S. A. E. specification No. 30. This alloy when cast in a ½-in. test bar in green sand and tested with out machining off the skin should give an average tensile strength of about 20,000 lb. per sq. in. and an average elongation of about 1.5 per cent. in 2 in. A modification of this alloy having somewhat better physical properties is now finding considerable favor in castings for the automotive industry. This alloy has an analysis of 7.5 per cent copper; 1.5 per cent. zinc; 1.2 per cent. iron, and the remainder aluminum. The tensile strength of this alloy will average about 21,000 lb. per sq. in. and the elongation will be somewhat greater than that of No. 12 alloy.

5 S. A. E. Specification No. 32 is another alloy of aluminum and copper which finds considerable use, especially in parts which need to be water-tight. This alloy contains from 11 to 13.5 per cent. copper, the remainder being commercial aluminum. (Commercial aluminum always contains iron and silicon in amounts of 0.25 per cent. and upward according to the grade of ingot.) Its tensile strength when the test bar is cast in green sand about ½ in. diameter and broken without machining off the skin should show an average of 20,500 lb. per sq. in. and the elongation will be practically nil. This alloy is used for carburetors, pumps, manifolds, radiators, engine cylinders, etc.

6 Another aluminum-copper alloy containing about 5 per cent copper is used for cast automobile bodies. This alloy has an average tensile strength of about 18,000 lb. er sq. in. and an average elongation of 3.0 per cent.

7 For pistons cast in permanent molds an alloy containing 10 per cent copper, 1.25 per cent. iron, 0.25 per cent. magnesium is extensively used. This alloy gives a good wearing surface both for the piston against the cylinder wall and for the bearings of the wristpin in the bosses. The pistons and camshaft bearings for the Liberty Engine were made from this alloy, the former being cast in permanent molds.

8 While the aluminum-copper alloys have been used mostly in the United States, light alloys containing zinc have been used more extensively abroad. The most common alloy in use in England for sand castings contains 13.6 per cent. zinc and 2.75 per cent. copper, the remainder being commercial aluminum. The specific gravity of this alloy is 3.0 and its tensile strength when cast in sand should be over 25,000 lb. per sq. in. and the elongation should exceed 1 per cent. In England the test bars of this alloy are cast in chill molds and the minimum physical property requirements are a tensile strength of 11 long tons (24,640 lb.) per sq. in. and an elongation of 4 per cent. This alloy is used in England as a substitute for our No. 12 alloy.

9 An alloy containing 10 per cent. zinc and 2.5 per cent. copper is put out in ingot form in England by the British Aluminum Company. This alloy should have a tensile strength of more than 22,000 lbs. per sq. in. and an elongation of more than 2 per cent. in 2 in.

10 Aluminum Manufacturers, Inc., use an alloy containing 7 per cent zinc, 2.75 per cent copper and 1.5 per cent. iron. This alloy has an average tensile strength of about 27.600 lb. per sq. in. when cast in green sand and an average elongation of about 4.5 per cent.

11 Zinc is added to aluminum up to

33 per cent. As the zinc increases up to this amount the tensile strength increases and the elongation decreases. The 33 per cent. zinc alloy has been used considerably in the past but it is too brittle to find extensive employment in the industries in competition with more ductile alloys which also have lower specific gravities.

12 At the Westinghouse Electric and Manufacturing Company an alloy composed of 95 per cent. aluminum and 5 per cent magnesium is used for starting-motor frames and other automobile work where extreme lightness and good machining qualities are essential. The specific gravity of this alloy is 2.47, the average tensile strength about 27,000 lb. per sq. in. and the elongation about 3 per cent.

13 At the United States Navy Yard, Washington, D. C., an alloy containing 2 per cent copper and 1 per cent. manganese is used for all aluminum-casting work. It is used for parts for gun sights, optical instruments, loading-tray sights for naval mounts, mine laboratory experimental work, parts for nitrating machinery for use in the manufacture of powder, etc. This alloy has a tensile strength of about 18,000 lb. per sq. in. and an elongation of about 8 per cent. Its proportional limit is very low, often not exceeding 2,000 lb. per sq. in.

14 An alloy containing 98 per cent commercial aluminum and 2 per cent. manganese is also used for certain aluminum castings which should resist the corrosive action of chemicals used in rubber molding.

Metallography of Aluminum Alloys

15 When the copper is added to aluminum the compound $CuAL_2$ is formed. This dissolves in solid aluminum up to about 4 per cent. copper at 500 deg. cent. and the solubility decreases to less than 1 per cent at room temperature. Above about 4 per cent. copper a eutectic forms between $CuAL_2$ and aluminum-$CuAL_2$ solid solution. The tendency for the $CuAL_2$ to separate out in the free state is very marked, that is, the solid solution seems to be easily divorced from it. The variable solubility of $CuAL_2$ with change in temperature makes it possible to change the properties of the aluminum-copper alloys by heat treatment.

16 Zinc forms the compound Zn_3AL_2 which is soluble in aluminum up to 40 per cent of zinc.

17 Magnesium forms Mg_4AL_4 which is soluble in solid aluminum up to amount 13 per cent magnesium at the eutectic temperature (450 deg. cent.). The solubility of the compound decreases with the temperature to about 5 per cent. magnesium at 300 deg. cent. and probably to still lower values at atmospheric temperatures. Under equilibrium conditions a eutectic is formed between the saturated solid solution and the compound Mg_4AL_4 when the magnesium content exceeds 13 per cent. Under normal conditions of cooling in sand, the eutectic is formed as a network around the grains when the magnesium content is over about 6 per cent. Magnesium also combines with the silicon present in commercial aluminum, forming the compound Mg_2Si. This compound is very brittle and renders the metal containing it in excess brittle.

18 Iron, manganese, and nickel form $FeAL_3$, $MnAL_6$ and $NnAL_6$, respectively. These constituents are very slightly soluble in solid aluminum and separate out in the form of needles when more than, say, 0.5 per cent. of any of the elements is present. The $FeAL_3$ needles have a strengthening effect on most aluminum castings by virtue of the fact that the normal eutectic network is made less continuous. As the fracture in nearly all aluminum castings takes place at the eutectic network, the $FeAL_3$ needles make the path of rupture greater and hence increase the breaking load. By increasing the breaking load more deformation is forced upon the more ductile excess material thus producing a higher elongation. Iron in amounts up to 1.5 to 2 per cent. may therefore be quite beneficial in aluminum castings.

Micrographs of the various constituents described above are shown but as we have pointed out do not mean much to any one but a chemist.

Physical Properties of Aluminum and its Alloys

20 Hardness. The Brinell hardness of pure aluminum is about 25 and that of the hardest aluminum alloy is more than 120. Where hardness is the controlling factor, any value between 25 and 120 can be produced.

21 Coefficient of Expansion. The coefficient of expansion of pure aluminum is about 0.000025 per deg. cent. The coefficient of expansion of the alloys varies between 0.000022 and 0.000027. Alloys containing about 5 per cent. magnesium have the higher coefficient of expansion and the high-copper alloys show the lower values.

22 Heat Conductivity. The heat conductivity of pure aluminum is about 0.50K or about 48 per cent. of the conductivity of copper at ordinary temperatures, and varies but slightly with temperature. The heat conductivity of aluminum alloys is less than that of the pure metal varying between 25 per cent. and 48 per cent. of the conductivity of copper, the general rule being that the greater the percentage of alloying elements, the lower the heat conductivity.

23 Electrical Conductivity. The electric resistivity of pure aluminum is about 2.94 microhms per cu. cm. The electric resistivity of the alloys is higher than that of pure aluminum, ranging up to 5.70 microhms per cu. cm.

24 Melting Points The melting point of pure aluminum is 658 deg. cent. The lowest melting points of the useful alloys range around 580 deg. cent.

25 Crystallization Shrinkage and Allowance for Pattern Shrinkage. The crystallization shrinkage of pure aluminum is about 5 per cent, by volume, and a further 5 per cent. decrease in volume takes place on cooling from the melting point to room temperature. The crystallization shrinkage is somewhat less in the alloys. The pattern shrinkage allowed for all aluminum alloys is 5/32 in. per ft.

26 Specific Gravity. The specific gravity of pure aluminum is about 2.7 and that of the alloys is not far from that calculated from the specific gravities of the various constituents. An alloy containing 95 per cent. aluminum and 5 per cent. magnesium has a specific gravity of about 2.47 and one containing 67 per cent. aluminum and 33 per cent. zinc a specific gravity of about 3.3. These represent minimum and maximum values for the usable aluminum-base alloys.

27 Modulus of Elasticity. The modulus of elasticity of aluminum is about 10,000,000 lb. per sq. in. Values as low as 8,500,000 and as high as 11,000,000 have been obtained.

General Observations on Aluminum Castings

28 Classes. Aluminum castings may be divided into three classes according to the method of manufacture, namely,

1 Sand Castings
2 Permanent-Mold Castings
3 Pressure Die Castings

29 Sand castings are so named because they are cast in either green or dry sand. The method of molding is very similar to that used for other metals except that the gates, risers, and chills must be used to suit the particular properties of aluminum and its alloys. Such parts as crankcases for gas engines, oilpans, manifolds, steering-wheel spiders, transmission housings, differential carriers, etc., are usually cast in sand.

30 Permanent-mold castings are made in iron or other metal molds and consequently have a greater degree of chill than the sand castings. The physical properties of the various alloys vary in proportion to the degree of chill. Molds for the permanent-mold castings are provided with ample gates and risers for feeding, consequently the permanent-mold casting is non-porous as distinguished from the pressure die casting, which is always porous in the interior. As a general rule the permanent-mold process is limited to small parts with simple shapes.

31 Pressure die castings are considered in a paper on Die Castings presented at this session by Mr. Charles Pack.

32 Maximum and Minimum Weight. Aluminum sand castings have been regularly made weighing as high as 480 lb. each, but one of from 150 to 200 lb. is usually considered a large casting. The minimum weight may be taken as 1 oz., but neither this weight nor 480 lb. should be considered as an extreme limit.

(Continued next month)

Mixing And Blending Foundry Facing Sands

Various Experiments to Prove Best Method of Getting Greatest Results at Lowest Cost. Miller Type of Machine Showed Most Favorable Results

By R. F. HARRINGTON

THE study of the reclamation of molding sands has, I believe, received considerable impetus within the past few years, especially in gray iron foundries, because of the increasing cost of raw material and dumping charges. Most of this study has, however, been put merely upon the development of machinery for recovery of the waste sand, with very little attention, so far as I am able to learn, upon improved means of mixing and blending. The recovery of the waste product was sought after rather than the more efficient mixing which would, from the start, demand less new material. Both propositions have, however, one main idea, namely that of increasing the tonnage of castings produced per ton of new sand used.

Some four years ago in a conversation with Dr. Richard Moldenke relative to a certain facing sand it was suggested that the sand might be bonded up or strengthened by the use of a very plastic fire clay. From the results of experiments conducted along these lines it was very evident to the writer that the use of clay, to any great extent, was limited, without the use of a better means of mixing or blending.

Up to the time of this realization, clay had been added to the heaps with some success in amounts up to 2 per cent. Having come to the conclusion that further additions of clay in amounts of over 2 per cent. were not successful, a series of experiments was undertaken for the purpose of determining mixtures and means of blending which would permit the use of larger portions of clay, with a consequent reduction in the amount of new material added.

Before entering upon the main discussion. I will digress to describe the three methods of sand testing which were used throughout the investigation.

The first two, or the so-called bond and sieve test, are devised to determine, in the one case, the amount of active clay substance present in the sand, and in the other the relative grain sizes and the percentage of clay substance. In the first instance, the amount of clay substance is obtained by measuring the amount of crystal violet die absorbed by the clay present; in the other case the relative grain sizes and the percentage clay substance is obtained by putting the sand in question through a series of standard sieves, reporting as the per cent. of fineness the amount of sand retained on each sive.

Originally Suggested By Dr. Moldenke

These two tests, as conducted were primarily the same as those originally suggested by Dr. Moldenke and later revised and improved upon by Messrs. Saunders and Hanley of Providence, R. I., as outlined in their paper before the Atlantic City convention in 1915.

For those not familiar with the tests as described by these gentlemen I would point out that the bond test as conducted consists of subjecting a given weight of the new molding sand, facing or rap sand to the action of the so-called deflocculating agent, whose function is to break up the sand conglomerates, separating the clay and sand particles in such a way as to allow more intimate contact with the dye solution, which is later added. Agitation with the deflocculating agent and the known amount of dye is brought about by a standard shaking apparatus.

After allowing the suspended particles to settle, the amount of dye which remains unabsorbed is measured either by comparison of the depth of color of the supernatant liquid with the depth of color of a standard solution by means of color comparison tubes or by dyeing skeins of cotton yarn with the unabsorbed dye solution followed by comparison with standard cotton skeins.

Thus, by obtaining the difference between the amount of dye unabsorbed and that originally added we are able to arrive at the amount of dye actually absorbed by the active clay substance present, whether it be the active clay substance in the new molding sand, facing sand, or clay. The result is usually expressed as the milligrams of dye absorbed by 100 grams of sand, the bond number varying in the case of sands from 300 to 1200 and in the case of clay from 1700 to 5000.

The sieve test consists of subjecting a known weight of sand to the action of a deflocculating agent as in the bond test and then separating the various sized grains by collecting them on sieves of 20, 40, 60, 80, 100, 150 and 200 mesh. Since all the clay substance and some of the sand grains are smaller than 200 mesh it is necessary first to transfer the sample to the 200 mesh sieve and wash with a stream of water. The sand particles passing through the 200 mesh sieve, which are termed 200 plus mesh, are separated from the clay substance by allowing the sand grains to settle and the solution containing the suspended clay particles is then decanted.

The residue collected on the 200 mesh sieve is then transferred to a dish, the sieves stacked, and the residue transferred to the upper one. Washing is continued until the particles have been retained on their respective sieves when they are dried in an air bath and weighed. As stated above, the weight retained on each sieve is recorded as the per cent. of fineness. The amount of clay substance is then determined by obtaining the difference between the total 100 per cent. and the sum of the per cents retained on the sieves.

The third or the transverse strength test is merely devised to measure the breaking load of a standard bar of molding sand or clay, and is to a considerable extent, a measure of the strength of the binder, whether this binder consists of the active clay substance present in the new sand added, or an artificial binder which might be added as in core sands. The bar used is 6 inches long and 1 inch square in cross section. The testing machine consists of a pair of knife edges 5 inches apart on which the bar to be tested rests. A load is applied at the center through a knife edge and lever system. The load is applied to the beam by means of a stream of shot which enters a bucket container. By weighing the shot the actual load in grams required to break the bars is obtained.

Below are given specimens of sand test records:

Green Jersey
Shipment 5-3-16
Bond No. 576
Mech. Analysis

Mesh	Per Cent.
20	8.46
60	18.70
40	19.12
80	9.26
100	4.70
150	7.26
200	3.00
200	13.24
Clay Substance	16.26
	100.00

Transverse Strength, — grs.

Laboratory Mixture
2-23-17
Bond No. 466
Mech. Analysis

Mesh	Per Cent.
20	15.28
20	28.80
60	17.00
80	7.36
100	3.40
150	1.04
200	5.20
200	11 52
Clay Substance	16.40
	100.00

Transverse Strength 220 grs.

Red Spotted Clay
Bond No. 3050

Transverse Strength, 170 grs.

The first step in the investigation was to obtain the bond tests and mechanical analysis of the new molding sand and old material entering the different mixtures throughout the shop. Having obtained these results in order to ascertain like results on the mixtures employing these sands, which, although costly, were satisfactory so far as the castings produced were concerned, bond tests and mechanical analyses were run for a period of one month.

Working, then, on the theory that good castings would result, other things being normal, if the proper bond and mechanical analysis was maintained, a number of cars of the same molding sand as previously used, but carrying 20 per cent higher bond, and this at no increased cost per ton, were obtained. This sand replaced the sand formerly used and because of the high bond or active clay substance present, allowed the use of 10 per cent. more old sand in the mixture. This sand was prepared as was the former mixture by merely cutting over the new and old material, tempering and putting it through a No. 4 Riddle.

Below is recorded the two facing mixtures with bond test of component parts together with transverse breaking load:

Original Mixture

Per Cent. Constituent	Bond	Contribution to Mixture
72 Jersey No. 3	475	342
20 Old Sand	275	55
8 Sea Coal		
	Total Bond	397

Transverse Strength, 440 grams

Mixture No. 1

Per Cent. Constituent	Bond	Contribution to Mixture
62 Jersey No. 3,	570	353
30 Old Sand	275	82
8 Sea Coal		
	Total Bond	435

Transverse Strength, 396 grams

It is noted that although in mixture No. 1 the amount of new sand added is 10 per cent. less than in the original mixture the total bond is approximately 10 per cent. more. This, of course, is due to the 20 per cent. more bond initially obtained in the new sand entering mixture No. 1, and, as stated above, this increased bond per unit of new sand added was made possible by the selection for this use of a molding sand containing a higher percentage of active clay substance.

To make clear what is meant by the amount of active clay substance, I will take for example two mixtures of sand. One mixture contains 95 pounds of silica sand of a definite mechanical analysis and 5 pounds of flinty clay. It is designated as mixture A. The other, designated as mixture B, makes use of 95 pounds of the same silica sand, but instead of 5 pounds of flinty clay makes use of 5 pounds of Jersey (Woodbridge) clay which is rated as 100 per cent fat by the geological survey.

A mechanical analysis of these two sands would show in both cases 5 per cent. of clay substance. Yet in one instance we would have a bond test of 250 and in the other a bond test of 125. This, of course, is due to the fact that the Woodbridge clay shows a bond test of 5,000 as compared to a bond test of 2,500 in the case of the flinty clay. This is easily noted in the tabulation which follows:

Mixture A

(Woodbridge)

Mixture B

Per Cent. Constituent	Bond No.	Bond Contribution
95 Silica No. 1	None	
5 Clay	5000	250
	Total Bond	250

Per Cent. Constituent	Bond No.	Bond Contribution
95 Silica No. 1	None	
5 Flinty Clay	2500	125
	Total Bond	125

From mixture No. 1 containing only 62 per cent new sand there were made 100 castings which so far as outward appearance and clean metal on maching were concerned, compared very favorably with castings made from the original mixtures containing 72 per cent. new sand.

A step in the right direction having been made so far as the use of more suitable sands was concerned, a mixture was devised as noted below which employed 1½ per cent. of clay for the purpose of reducing the amount of new sand necessary to supply the required bond. This mixture is as follows:

Mixture No. 2

Per Cent.	Constituent.	Bond.	Bond Contribution to Mixture
47	Jersey	570	268
44	Old	275	275
1½	Clay	3000	45
7½	Seacoal		
100	Total bond		434

Transverse Strength, 226 grams

Here although the proper bond and texture had been maintained, scabbing was encountered on a large number of the castings. A careful study of the mixture as prepared for use on the foundry floor revealed the fact that the clay added had not been properly mixed and when slicked with the trowel had caused a sputter when in contact with the hot metal. In an endeavor to overcome this difficulty a mixer illustrated in Fig. 3 was employed. By means of the much more thorough mixing obtained in this machine, the difficulty of scabbing was overcome to a great extent.

A further attempt, however, to decrease the amount of new molding sand necessary by the use of further clay additions showed conclusively that the limit had been reached unless a more complete blending of the component parts was made possible by some other type of machine.

A careful review of the results of the above experiments developed certain important facts, namely, that while the mixer gave a more complete mechanical mixture as compared to the hand prepared facing sand and at less cost per ton for mixing, it did not permit the use of any less new material than a well prepared sand mixed by hand. In other words, there was nothing to be gained in the operation of the mixer insofar as use of less new material was concerned, the only advantage being in the fact that it usually permitted the same mixing at a less labor cost per ton. A careful study of the mechanically and hand mixed sands under the microscope revealed no marked difference, insofar as the coating of the burnt grains of sand with the new sand and clay was concerned. Results of the breaking of transverse test bars also revealed no greater tenacity of the grain particles, which would be a criterion of the thoroughness of mixing.

With the necessity in mind of increasing the efficiency of all new material used in the facing by more complete blending, a so-called pan muller was purchased for this purpose. This, one might describe as a machine consisting essentially of a cylindrical pan, with a bottom of cast iron, about 5 feet in diameter and sides of sheet steel 1 foot high. Resting on this pan are two heavy cast-iron rolls approximately 2 feet in diameter and 8 inches wide. These rolls are held in position by guides which allow revolution only about their respective axes due to contact with the pan and its contents.

While awaiting the arrival of the muller, the mixture designated as No. 2 was run in the foundry for a period of two months. This mixture, which mode use of 1½ per cent of Jersey fire clay together with a high bonded Jersey sand was mixed in a paddle mixer. Eventually it replaced the mixture previously used with a consequent saving of approximately 22 per cent. of new material, or approximately 95c. per ton of facing mixed.

The first test employing the muller as a means of mixing was made for the purpose of determining the effect of the mulling action on the character of the facing. The effect of this action, so far as increased efficiency of all new material added is concerned, is best shown by a study of the tabulated results which are recorded below. They represent the breaking loads on three sets of bars made from the same mixture of sand but mixed by hand, in the mixer, and in the muller, respectively.

From the following data it is seen that the mixer offers no better means of mixing so far as the strength of the sand obtained is concerned, but that the muller does by its peculiar action offer a far more efficient means of mixing or blending.

The results of the tests are as follows:

Hand Prepared Mixture No.1		Machine Mixture No.2		Muller Mixture No. 3	
Bars	Ounces	Bars	Ounces	Bars	Ounces
A	9.5	A	10.	A	12.5
B	10.5	B	9.5	A	13.5
C	10.5	C	10.5	C	14.5
D	10.5	D	11.0	D	12.5
E	10.	E	9.5	E	10.5
F	11.	F	10.	F	14.
G	10.3	G	9.5	G	14.
H	10.	H	10.	H	12.
I	10	I	10.	I	13.
J	11.	J	10.	J	12.
J	11.	J	10.	J	12.
Ave.	10.3	Ave.	10 oz.	Ave.	13 oz.

The first sand mixtures for facing purposes prepared in the muller varied in clay content from 1 to 7 per cent. and in new sand content, from 10 to 50 per cent., these mixtures making use of varying proportions of new sand and clay, in some instances consisting of clay and old sand only and in other instances, of only new and old sand.

This long series of experiments was made necessary because of the entirely new action in the muller with its consequent effect upon the character of the facing and its action when in contact with the hot metal. At this point in the work it was found that the bond test could no longer be used as a means of measuring the strength of the sand, the change in the method of preparation so increasing the effectiveness of the mixing as to make bond tests no longer comparative. The transverse strength and a mechanical analysis, was found to be the most satisfactory means of judging the character of the sand.

After months of experimenting and extended use of many different facing mixtures, mixtures Nos. 3, 4 and 5, as noted below, were, after trial in the foundry, adopted as satisfactory:

Mixture No. 3

Per Cent.	Constituent	Bond	Contribution to Mixture
60	Old Sand	275	165
30	Jersey Sand	570	171
3½	Clay	3000	105
6½	Sea Coal		
	Total Bond		441

Transverse Strength, 355 grams

Mixture No. 4

Per Cent.	Constituent	Bond	Contribution to Mixture
57	Old Sand	275	157
15	Jersey Sand	570	86
20	Millville Gravel	700	140
8	Sea Coal		
	Total Bond		383

Transverse Strength, 310 grams

Mixture No. 5

Per Cent	Constituent	Bond	Contribution to Mixture
57	Old Sand	275	157
20	Beach Sand		
15	Millville Gravel	700	105
8	Sea Coal		
	Total Bond		262

Transverse Strength, 210 grams

These mixtures all received 1½ minutes mulling action, and although prepared for different classes of castings, they are based on the same principles thorughout, namely, the use of such proportions of new sand, old sand and clay as to give a facing which would not, when in contact with the metal, be subject to scabbing or blowing. Mixture No. 5 illustrates the necessity of using a sharp sand to give proper texture and working qualities.

A study of the foregoing mixtures as compared to the mechanically and hand prepared mixtures, again reveals the fact that a much lower active clay substance is necessary, the mulling action giving sufficient strength to the facing, as noted by the breaking loads of the transverse bars.

In conclusion the writer offers the following comparative new material costs of the different mixtures:

Original Mixture

72%	Jersey at $4.00	$2.88
8%	Sea Coal at $9.00	.72
		$3.60

Mixture No. 1

62%	Jersey at $4.00	$2.48
8%	Sea Coal at $9.00	.72
		$3.20

Mixture No. 2

47%	Jersey at $4.00	$1.88
1½%	Clay at $7.00	.11
7½%	Sea Coal at $9.00	.67
		$2.66

Mixture No. 3

30%	Jersey at $4.00	$1.20
3½%	Clay at $7.00	.25
6½%	Sea Coal at $9.00	.58
		$2.03

Mixture No. 4

15%	Jersey at $4.00	$0.60
20%	Millville at $4.00	.80
8%	Sea Coal at $9.00	.72
		$2.12

Mixture No. 5

20%	Beach at $1.60	$0.32
15%	Millville at $4.00	.60
8%	Sea Coal at $9.00	.72
		$1.64

These figures, it is believed, are sufficient to show the worth of such a series of experiments as outlined above. As to the merits of the different types of machine for mixing or blending, the writer most heartily recommends the muller as being in his opinion the machine which, because of its more effective blending, will allow the use of the minimum amount of new material.

Research Council Studies Molding Sand

Committees Appointed to Deal With the Formulation of Standard Tests for Determining the Working Properties of Molding Sand, Reclamation of Old Sand, Manufacture of Synthetic Sands

HUNDREDS of thousands of tons of molding and core sands are used annually in the iron, steel and non-ferrous foundries of America. A little of it is re-used; much more might be. Sands are not always correctly selected for specific purposes. Mixing and other tretment can secure improvement. In what ways can foundry practice as to sands be bettered? What economies can be realized, not only in reduced expenditure for sand, but also in less number of lost castings and higher quality of accepted product?

Last Spring, the American Foundrymen's Association decided that thorough study of this subject wold be profitable and asked the co-operation of the American Institute of Mining and Metallurgical Engineers. The Institute referred this request to the Division of Engineering, of National Research Council, of which it is a member. Through joint action with the Division a valuable digest of the literature has been made by Professor Robert E. Kennedy, of the University of Illinois, and a large committee of foundrymen, engineers and scientists has been selected, under the general direction of President W Bean, of the Foundrymen's Association and of the Chairman of the Division.

This committee on Molding Sand Research has just been organized with the following officers and executive committee:

Chairman: R. A. Bull, Consulting Engineer, Sewickley, Pa.

Secretary: Robert E. Kennedy, Assistant Sec'y., American Foundrymen's Association, 909 W. California Street, Urbana, Illinois.

W. R. Bean President, American Foundrymen's Association, Naugatuck, Conn.

Henry B. Hanley, Metallurgist and Chemist, 107 Ocean Avenue, New London, Conn.

Jesse L. Jones, Metallurgist, Westinghouse Electric & Manufacturing Co., E. Pittsburgh Pa.

Prof. Henry Ries, Geology Dept. Cornell University, Ithaca, New York.

Dr. Bradley Stoughton, Consulting Engineer, 10 East 44th Street, New York City.

Dr. George K. Burgess, Chief, Division of Metallurgy, Bureau of Standards Washington, D.C.

The committee has 35 members representing the many interests in the use of molding sand.

At a meeting of the Executive Committee November 26, in the office of Division of Engineering, Engineering Societies Building, New York City, three sub-committees were appointed to deal, (1) with the formulation of standard tests for determining the working properties of molding sand, (2) reclamation of molding sands and greater use of old sands, and (3) methods of manufacturing synthetic sands. A meeting of the main committee will be held in the Engineering Societies Building, 29 West 39th Street, New York, on December 9, to lay out a comprehensive program of research which will include the assigning of the various problems to appropriate laboratories and industrial plants. Some field work will be necessary in connection with these investigations.

The co-operation of men having like interests in Canada and England is assured and invitations have been extended to France and Belgium.

ALFRED D. FLINN
Chairman, Division of Engineering National Research Council.

NEW SAND-BLAST BARREL FOR SMALL IRON AND BRASS CASTINGS

We have often wondered why with the almost universal use of the Sand-Blast in iron and steel foundries, and its wide application to various industries during the war, there had not been developed a machine suited to the demands of the small brass foundry or other industries producing small work.

In a new Sand-Blast Barrel just introduced, by the Pangborn Corporation every requirement of the plant producing small work or small volume seems to have been understood and met, for it occupies small floor space, and being of the suction type, is entirely self-contained, giving continuous operation without use of elevator or conveyor. It operates with air volumes as low at 47 cu. ft. per minute at 80 lbs. and but 32 ft. at 50 lbs. (less at lower pressures). Probably its strongest appeal is that it sells at a price within the reach of any plant, for while there have been offered efficient Sand-Blast Barrels for many years, the first cost has been such as to prohibit their use in the plant of small output, so that in this respect this Barrel is unique.

The device consists of a sheet metal, dust tight, cabinet or housing, on a structural steel frame, the bottom being hopper shape to receive the abrasive, and equipped with a feed box to which is attached a hose that conveys the sand to the nozzle.

The Barrel Drum, mounted within this Cabinet or housing is 24 in. diameter by 16 in. long, and is constructed of perforated sheet metal, mounted on a shaft at one end, supported in bearings of large size. This shaft is equipped with a gear, engaging a worm (in reduction) on the main driving shaft, which is equipped with tight and loose pulleys and belt shifts. The entire driving mechanism is contained in a cast housing, all outside the cabinet or barrel housing, being integral with the structural frame.

An opening at the other end receives the nozzle, which is mounted on a swinging bracket to permit of easy access. Dust tight doors close the barrel housing and opening for the nozzle.

The interior of the barrel drum is fitted with baffles which turn the load as it rotates slowly, bringing all pieces and all faces under the blast action. The spent abrasive drops through the perforations of the drum, into a screen tote box beneath the drum and through into the hopper for reuse. The tote box receives the load when the Barrel is dumped.

A door the full length of the drum is held in place by a double spring latch. An opening is provided in the top of the Cabinet for attaching to an exhaust system.

The machine occupies a floor space of 2 ft. 7 inches by 3 ft., 6 inches and is 5 ft., 6 inches high.

THE VITAL IMPORTANCE OF ACCIDENT PREVENTION

By Victor T. Noonan

The Amercian Foundrymen's Association at its meetings should consider and devise some plan to bring home to all its members and their employees in the United States and Canada the very vital importance of conserving manpower—in other words, more fully protecting human life and limb and reducing industrial accident to a minimum. It is now as clear as daylight to all who have given any thought to accident prevention, that at least 50 to 75 per cent. of the accidents occurring in workshops and factories can be eliminated. The splendid accident reduction experience of the United States Steel Corp. and of thousands of individual plants throughout the country, has proved beyond the shadow of a doubt the great possibility of preventing both fatal and nonfatal accidents.

State Survey of Accidents

During the past year the department of safety of the industrial commission of Ohio has conducted a survey in about 500 of the larger industries of the state with a view to finding out definitely what results were being obtained by organized business-like safety work. The survey shows that where accident prevention is a business-like department, thoroughly organized, with workmen's safety committees, and where the number, cause, frequency and cost of accidents were carefully kept and accidents investigated, there was a reduction of anywhere from 25 to 75 per cent. in the number of accidents reported since these companies had commenced their accident prevention work.

In spite of the good work that has been accomplished along safety lines much more can be done. I am glad to say that war has given the safety movement throughout the country a much needed stimulus. It has become apparent that for every soldier we send to the trenches we must protect and safeguard at least 10 workers in the factories. When one of these workers is killed or disabled by industrial accident the loss of that worker to the country to my way of thinking is 10 times greater than if one of the boys in the trenches had been killed or disabled. Accident prevention, therefore, should be a very important war activity, in fact, it should be one of our most important war activities.

Accident Prevention and Patriotism

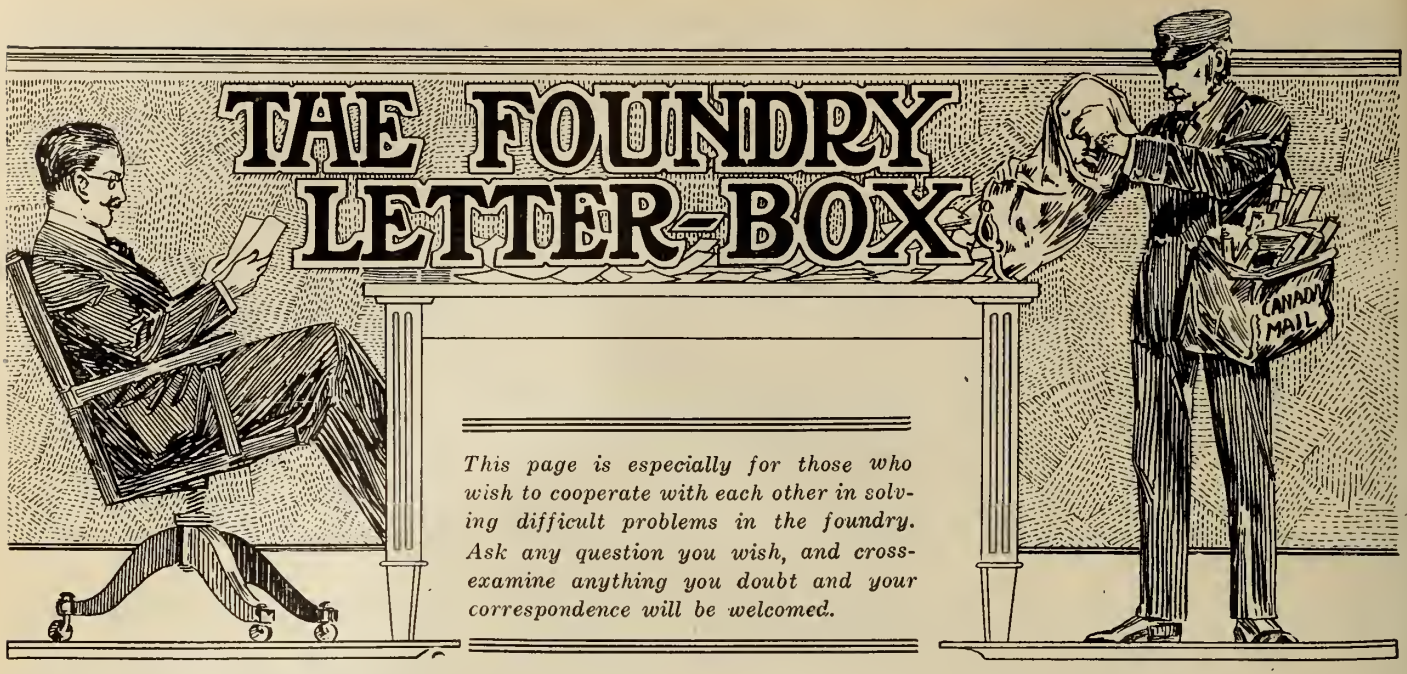
Employers and workmen alike must consider it the highest patriotic duty to do everything possible to prevent accidents. It is a victory for better living, better citizenship and happier homes.

Industrial accident prevention, therefore, gives us a great opportunity to make the industrial life of our country a safer place to work in. Industrial accident prevention will not only teach men and women to be more careful but it will teach all the workers as well as employers how to think. It will teach them to be more industrious more thrifty, more sober and more upright. Industrial accident prevention will also give all of our people a higher appreciation of the value of human life and limb and surely in these days when life and limb is held so cheaply, that higher appreciation is sadly needed.

No industrial organization can do more to promote industrial accident prevention than the American Foundrymen's Association in United States and Canada, working as a body and also each foundry working individually.

In Ohio during the past four years considerable educational accident prevention work has been accomplished, including: First, through meetings of employers, superintendents and foremen; second, through meetings of employes; third, by safety exhibits; fourth, by safety commission pictures illustrating the cause and prevention of accidents reported to the commission; fifth, by safety bulletins and other literature; and sixth, by a study of the accident experience of individual plants or groups of industries.

Effective December 1st, Mr. T. Martin, divisional engineer of the C.P.R., Revelstoke division, was transferred to the Nelson division, succeeding Mr. J. H. Sloans. The latter, effective December 1st, replaced Mr. Martin as divisional engineer of the Revelstoke division.



This page is especially for those who wish to cooperate with each other in solving difficult problems in the foundry. Ask any question you wish, and cross-examine anything you doubt and your correspondence will be welcomed.

WHAT PEOPLE LIKE TO READ

In the August issue we published an account of a lead keel which was cast at the foundry of the Otis-Fenson Elevator Co., Hamilton, Ont., in which the foundry superintendent Mr. James Allan had the best of success. Again in September we published a little article on how "Ye Editor" tried to make one in his younger days." While the articles were running we were also publishing some little stories about castings which the Romans made a couple of thousand of years ago. All of these stories brought letters from interested readers, the following being a sample. "I have been very much interested in your articles on "Bronze Antiquities." They are very instructive and interesting. Also your description of the making of the lead keel was good. It revealed a lack of knowledge that is common to all of us, especially in our adolescent days. However there was a touch of humor in the description although the joke was hid from you at the time by the smoke from the lead. It is well to look at the humorous side of the difficulties of life.

"When I was young we made a lead keel in the shop where I worked at that time. They did about the same as you did; they sent a lot of the lead up in smoke. The next one they made, they melted the lead in ladles, and this one was a success, only a small percentage being lost in the melting."

Another subscriber sent in a clipping from the Scientific American of June, 1882 giving a description of how a keel was made nearly forty years ago. The clipping makes reference to a former keel which had been made and described and the reader should have read the former one in order to properly understand this one. However, we will assume that the wooden keel which formed a part of the boat was turned upside down in front of the furnace and the mold built on top of it and the lead poured right where it would remain. Following is the letter from this quarter together with the clipping.

Friend Editor;

To undertake the making of a lead keel in a shop not well equipped for work of this nature, calls for some ingenuity on the part of the individual who has the directing of the job, as well as a knowledge of the physical and chemical properties of lead, else the mistake which you in youthful confidence made, when you undertook to cast a two ton keel, and burned up a portion of the lead in the cupola, is liable to happen.

In looking over a bunch of old notes and clippings, a few days ago (the writer's reference library) I came across the enclosed clipping, describing the method employed in making a lead keel for the U. S. cutter "Wenonah," some thirty-nine years ago. Thinking lead keels might possibly interest you or somes of the C. F. readers is my reason for sending it to you, and as the August and September numbers of the C. F. contained articles on this subject. The cutting I think is from the "Scientific American" of June 1882.

The Lead Keel of the Wenonah

A twenty-one ton lead keel for the new cutter Wenonah was cast by Mr. Henry Piepgrass, in Brooklyn, May 16. The process employed is thought to have been an improvement on that used in casting the thirty-three ton keel of the Bedouin, noticed some weeks since.

In the former casting there were two pots resting on the top of brick furnaces; in this one there was but one pot, and that was entirely inclosed in the brickwork, so as to economize heat. The pot was oblong in shape, about 8 feet in length, 2 feet in width, and 2½ feet in depth. In the side of this and close to the bottom were two poles three eighths of an inch in diameter. Leading from these were two iron troughs reaching to the mold, which was formed on the underneath side of the oak keel, which was turned bottom upward alongside of the three furnaces. The keel was 55 feet in length; the mold extended for 30 feet along its center. In the previous casting the molten lead, as it ran into the mold, was cooled to prevent its scorching the wood, by the addition of cold lead; in this one the lead was put in first, the mold being filled with six tons laid loosely, so as to permit the liquid metal to freely flow through it. The wooden keel was also laid with a slight incline. so that its lower end should fill first. The fires in the three furnaces were lighted at noon with about fifteen tons of lead in the pot. As the mass melted additional pigs of lead were thrown in, and at 4 o'clock live coals were thrown on top of the melting lead and a bright fire was kindled on its surface to counteract the effect of the cold wind. At 5:30 there were twenty tons of lead in the pot in a liquid state. Then Mr. Piepgrass, stationing his men at the lower end of the mold, partially withdrew the bar from the hole nearest to this end and permitted the stream of lead to flow as more lead was put in at the top. As the liquid metal reached the top of the mold at its lower end the attendant workman spiked on the covers of plank, repeating the process until the iron trough was reached; then Mr. Piepgrass stopped the flow from this hole and withdrawing the other suffered the lead to flow and fill the other end. When the mold had been entirely filled there was left of the whole quantity of twenty-five tons three and a half tons in the pot and a half ton outside. The lead remaining will be cast in molds to fit the frames of the yacht, which will have, in addition to her keel, twenty tons of ballast inside.

HAS TROUBLE WITH DAUBING

Editor Canadian Foundryman:

I am having trouble with my cupola lining. No matter how much daubing I put on or what kind of daubing I use it is always gone after the heat is over and the bricks are burned out worse each time than they were the heat before. Should I dry the lining each time? or what should I do?

The trouble which you are having is, unfortunately, a universal trouble. Every cupola tender finds his cupola in worse shape after each heat. The daubing is a protection to the brick lining and prevents it to some extent from burning but cannot prevent it entirely. Drying the lining each time is not usually advised as it would be a difficult proposition where a heat was run each day, but where possible it is advisable as it has good features. Whenever it is found necessary to put more than an inch of daubing on the brick it will be equally as necessary to dry it in advance of the heat or else it would have been better left off. An inch of daubing will dry from the heat of the kindling and the coke while it is being lit through, but if daubing in excess of what will be thoroughly dry when the blast is put on is used, it will run off like melted metal within a few minutes. A crust will form on the face, but that which is back of it will still be wet, and it will not only create a steam pressure which will crack the surface but it will melt and run down. This melting of damp mud is not properly understood by very many foundrymen. A good idea of what transpires in the cupola can be gained by watching the programme on a brick yard where ordinary building bricks are being made. The bricks are left lying in the sun for a few days so as to allow the sun to evaporate most of the moisture, and when they appear to be perfectly dry they are put in the kiln. It may take four or five weeks to get a sufficient number of bricks to build a kiln, and all this time the summer weather is drying the bricks, but when all is ready and the fire lighted, a slow fire has to be kept up for two days and nights, during which time steam will be seen coming off the kiln. If those bricks are allowed to become red hot while any of that moisture is in them they will melt, but if a slow fire is kept burning until nothing but heat waves are seen to be given off the brick can then be burned perfectly. This same procedure takes place in the cupola, and it is a safe assumption that most of the daubing in every cupola is gone within a few minutes after putting on the blast. First-class daubing is often condemned for this reason. If a small amount of salt is mixed with the daubing it gives it a smooth glaze on the face which protects it from the abrasive effects of the fuel and iron. If the lining requires any repairs, ever so slight, in addition to the thin wall of daubing it is always best to give it a good drying. This cannot be done satisfactorily by putting in extra kindling. The drying should be done on "off" days and done thoroughly. There is no reason why the daubing should not be as good as the bricks if it is made of good material and properly burned before being subjected to the terrific heat of the coke fire when melting iron.

THE "DODGE IDEA"

We believe that time has come to speak many things. Right now we believe the truth should be written, spoken and thought. Business, for the past year and a half, has been toddling an erratic course. Everything from the war to the tariff and the boll wevel has been blamed for the situation. Prior to the presidential campaign, newspapers and the trade-press—and there were but a few exceptions among the press, whether supporting one faction or the other—failed to tell the truth and practicaly every item in the ages was colored and distorted to fit the political belief of the newspaper or magazine. With all of this diversification of opinion is it a wonder that the average business man began to be doubtful and to start the process of retrenchment that has been spreading like wild fire across every dimension of our industrial field? Too many editors threw bombs and expected to reap profits and their twisted philosophy helped blow business into a cocked hat. It takes about thirty seconds to blow up the city post office but it takes a good many years to re-build it. To-day we must plan on re-building; the bombs have been tossed and if we rebuild we must say to ourselves, "This can never happen again!" And having said it we must bend our energies toward that very thing.

The time has come when the trade press must speak the truth even though it be unpleasant. An operation for appendicitis is unpleasant—but it is necessary sometimes. And the patient feels better after it is all over. The Dodge Idea commits itself to the course of telling the truth even if it be painful. Policies, trends and destructive agencies must be eliminated if business is going to ever be on a decent price-profit level once more. The trade press of this country can and does exert a powerful influence on industrial conditions and that influence can be made constructive only by telling the truth and letting the chips fall where they may.

We want better business; our advertisers want better business—all of us want better business but we cannot get it by dodging facts or slighting or eliminating mention of those conditions which go to obstruct modern business.

This is a sincere invitation to the trade press of this country to help business by telling the truth. The Dodge Idea is definitely committed to that course because we believe the eternal triangle of editor, reader and advertiser demand it.

Let's go!

"HIGHST" UP OR DOWN?

A few days ago Canadian Foundryman's representative made one of his regular calls on a little jobbing iron foundry not far from Montreal. This little shop did a wide range of repair work and had one or two interesting characters employed there.

One of these we will call Charlie. He was a tramp moulder who had been with the little foundry for about six months. Nobody knew much about him. He was a single man, said little about himself, was a good worker, and was always cheery. He did not seem to have a care or connection in the world. However, on the all-important occasions of the semi-weekly cast, all humor was cast aside and one would think that Charlie carried the responsibility of the world on his shoulders.

Another character was Bob. Bob was of uncertain age. It was stated that he was over seventy, but as he could not read or write he was not able to verify or deny the statement. Bob had worked in the little foundry for many years. He was a cupola tender, core maker, and general assistant at the two jib cranes when a cope was lifted or replaced. Bob knew no one could operate that crane as he could when it was used to draw a pattern. Bob could prepare the cupola for a cast as no one else could. The rusty old scales on the charging floor responded only to his personal methods. The weights were all marked in such a way that Bob could gauge a two ton heat or a fifteen hundred heat to a nicety. Certain weights were put on the bar and when the lever went up why the necessary amount was there. What did he care if it overran 100 pounds? He would have enough anyway and what was left over at the end of the heat he would run into pigs and break up to remelt.

So much for Bob and Charlie. Now Charlie always gave instructions to the crane something like this; "rack in, rack out, hoist up, lower down," etc. Now this day was casting day. Charlie had made a mould of a big spur gear and was looking after it with tender care. He got his big ladle full of metal and carefully skimmed it and transported it over to the mold. Bob was at the crane. The occasion was momentous. Charlie started to pour slowly the stream of iron into the runner. The size of the stream was increased and the ladle was tipped over at a greater angle. The stream of molten metal began to slacken; then Charlie shouted, "highst, highst." Bob never moved. Again came the command "highst". Bob came back with the inquiry as serious as he had ever been, "up or down Charlie?"

Never touch an electric light fixture and a water tap at the same time, as by so doing you may be the connecting link in a circuit and electric current will pass through you with fatal results. Don't meddle with electricity if you do not understand it as it is dangerous.

F. H. BELL, Editor

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

B. G. NEWTON, Manager
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Back to Business Again

WITH the Federal elections over and the issue definitely settled as to what group will form the next government, foundrymen like other citizens will turn their attention again to matters immediately pertaining to their own line of work.

During the last few months conditions in the trade have been sufficiently quiet to permit of more than a little speculation in idle hours as to who would be the "ins' and who would be the "outs." Sometimes, perhaps, the argument in shops has become almost as warm as the metal going into the molds, but public excitement over elections cools down just the same and almost as quickly as the hot metal after it leaves the molder's ladle.

Before people are hardly aware of it announcements will appear that Hon. W. L. Mackenzie King, the new 47 year old bachelor prime minister, has formed a cabinet and is moving off to occupy the seats of the mighty on Parliament Hill. Then there will be some headlines devoted to Hon. T. A. Crerar, lining up his progressives into a formidable opposition so as to keep the liberals in a straight and narrow path. Concurrently the spotlight will be turned now and then on the conservatives, as the third and smallest group, to disclose how they will play ball with their conquerors at the bat.

Curiosity will also entertain itself in trying to find out how fate and a brand new government will deal with the tariff. With Quebec ticketed as favorable to protection and controlling sixty-five solid seats, and the West being distinctly of the progressive school and inclined to sweeping reductions, there is enough of a puzzle to keep all guessing when they wash up for the noon hour or light their pipes to go home at night.

The hope is entertained, (and there is always a good pair of crutches under the arms of the man who walks with hope) that the new year will see a revival in business generally, not because any particular party has been elected to power but because elections and attendant turmoil are over for another four or five years. This is the subject over which foundrymen are mostly concerned and in the weeks to come more and more thought should be devoted to this feature than to the happenings af December 6th, which have already been written on a page of history which is turned over.

The Business Paper Gets at the Facts

A STRIKING illustration of the service the technical or trade paper renders its readers and of the difference in the reliability of the information it supplies and that furnished by the average daily newspaper is afforded by an article in a recent issue of the "Railway Age Gazette" with reference to Henry Ford of automobile fame and railway management.

Mr. Ford as many of our readers will have learned from the newspapers, recently purchased the Detroit, Toledo and Ironton Railway, a small road which was practically in a state of bankruptcy. In the same papers they will also have read how Mr. Ford put in his management in March, and in April the net operating income had risen from $78,000 to $276,000. For several months past the various newspapers, magazines and labor publications of the States have been jumping at conclusions and drawing deductions from this one month's figures, enlarging upon the fact that, in spite of higher wages, Mr. Ford had succeeded in making his railway a paying proposition, and in many cases it was hinted that here was the man who could straighten out the railway systems of the country and place them upon a stable and profitable basis.

The "Railway Age Gazette," however, was not content to accept these hastily drawn conclusions as decisive and started an investigation on its own account, with the result that when the figures for several months of Mr. Ford's regime were examined a very different tale was unfolded. The income of $276,000 in April had dropped to $187,000 in July and in August to $70,000, lower than it was when Mr. Ford took the road over. Expenses, moreover had increased from 52.7 per cent. to 59.7 per cent. in July and 71.8 per cent. in August—this in spite of the fact that gross earnings which were $713,000 in June had increased to $744,000 in July and still further to $763,000 in August. Moreover, while the operating had thus increased 46 per cent., those of the ordinary railways of the country had increased only one per cent.

The point in this incident which immediately concerns our readers and ourselves is not so much the success or failure of a railroad as that to a business paper is due the fact of the truth being made known. During the last few years occurrences of this nature have been frequent in connection with the series of trade and technical publications of which this paper is one. Inaccurate and misleading information giving rise

to serious complaints has been published on one subject or another by the daily papers. The public have been worked up to a pitch of indignation by some statement which upon investigation has been found to have no foundation, and it has been left to the business paper to show that the complaint was therefore groundless. It is the reliability and accuracy of all information published that differentiates the business paper from the ordinary newspaper and makes it of such high value to its readers.

* * * *

Compliments of the Season

IT SEEMS hardly possible that a year has slipped by since we were last privileged to greet our readers with best wishes at the festive season which is again so near at hand, but time flies and the toboggan has again about finished its course down the slide of another year.

The year which is taking its departure has not been what we could call a particularly prosperous one, but it has had comfort to its credit in that we had no war with its nightmare of a casuality list to haunt us. The year 1921 has been a peculiar year in many ways. To the working man it has been a hard one while to the profiteer it has been a harvest. The farmer has been hard hit by the drop in the price of what he had to sell but not in what he had to buy. The drop in the price of farm produce seemed to have little effect on the price of foodstuff and the man who happens to be out of employment is not in a position to meet the price of living. All told it is a year which we cannot wish to see repeated. Happily the prospects are looking brighter and it is confidently believed on all sides that the new year will bring better times. Predictions count for little, however, so we will be content to receive the good times with open arms when we meet them but not before.

To many, Christmas will not be as full of good cheer as could be wished but it is to be hoped that none will be allowed to suffer. The little ones in particular must have a call from Santa Claus at all costs.

However, bad as the past year has been we cannot improve it by raking it over so let us forget it and look only to what is before us. As we have pointed out on several occasions Canada has all along been in the most favorable condition of any country of the world, and has had the least unemployment. So while it has not been a gloriously prosperous year we will have much to be thankful for.

This will be our last opportunity to meet our readers until after the holiday season is over and the year 1922 is well on its way, so with the most optimistic feelings regarding the coming year we wish you all a Merry Christmas and a Happy and Prosperous New Year.

* * * *

Should Editors Have Opinions?

EVERY publication whether a magazine, technical or trade paper or just an ordinary newspaper has an editorial page which is accepted by the reader as the home of the editor himself, or as some would say, the policy of the paper which in reality is the private opinion of the editor or the concern by which he is employed. All of this may be true but is it necessary that either the editor or the publisher should have a publicly expressed opinion on every topic that might come up? We think not. An editor is just the same as anyone else. He may have his own private opinion but that opinion is for his own guidance. An editor might be likened unto a judge when he is not doing the judging. A jury sits in court and listens to the two opposing lawyers who are not trying to get at the truth of the case before them but to bring out the strong points on their respective sides. Some of the jurymen incline to believe both of the lawyers while others believe neither of them. After each lawyer has spoken his piece the judge asks the attention of the jury while he gathers up the points which really count and spreads them before the jurymen who, after absorbing the judge's information, which was, to the best of his ability, an unbiased presentation of both sides, go to their retreat and use their own judgment on arriving at a conclusion, but, of course, using the addresses of the opposing lawyers and the judge for whatever they were worth.

So it is with an editor. He, in the name of fair play, must let the public, who are the real jurors, have all the divergent opinions which are advanced, and then in his humble way, bring out the weighty points and present them, shorn of their sarcastic, selfish, one-sided and otherwise undesirable features, present them in as presentable form as possible on the editorial page and leave the public to draw their own conclusions. Canadian Foundryman takes this stand. We try to stick close to the foundry, and while the foundry has many features and can be viewed from many angles we include them all, the buildings, equipment and men. If the men who own the foundry and those who work in the foundry cannot agree they can disagree, and it will be all the same to us. We report their troubles along with their other doings but leave them to do the settling.

We all agree that strikes are a nuisance and should not be but we do not all agree on how to avoid them. So it is on the various other topics which crop up, we are prepared to give our readers all the views we can get and let them do their own deciding.

* * * *

Automobile Fatalities Decreasing

THE records for automobile fatalities for Toronto for the eleven months of 1921, as compiled by the Safety League shows a total of 45 such deaths on the streets of Toronto. This figure is a noticeable improvement over 1920 when there were 64, which means a reduction of 30 per cent. in fatalities, in spite of an increase of thousands of motor cars registered in Toronto in 1921. In the months of January to November inclusive, 1919, there were 47 automobile deaths on the streets of Toronto, so 1921 shows a slight improvement there too.

Officials of the Safety League state that definite results may be expected from the safety campaign being conducted, particularly among the children in the schools.

* * * *

Tests on Hollow Steel Casings

A PAPER issued by the Bureau of Standards at Washington gives an account of the tests on six hollow cylindrical steel castings manufactured by the centrifugal process. The castings were 6ft. long and of diameters up to 18ins., with holes of various diameters through them, and they were made with the mould revolving about the axis at a speed not specified in the report. Samples of the metal taken from different parts of the complete castings were tested for hardness, tensile strength, soundness, structure, and density, both in the condition as cast and after heat treatments of various kinds. It was found, says Engineer, that there was a slight segregation of carbon, phosphorous, sulphur, nickel, and copper in the radial direction, but none of manganese and silicon. Small blow-holes were evident in the inner 1/16in. of the castings. After heat treatment several of the castings showed mechanical strength equal to forged materials of the same composition, and satisfied the ordnance requirements for gun forgings. Microscopic examination showed no hard spots, flaws, or other defects outside the layer 1/16in. thick at the inner surface, and the process appears to be one of great promise.

Scraps *from* The Foundry Scrap Pile

Lubri-Geiters, Limited, Montreal, Que., has been incorporated to engage in the iron foundry business, with a capital stock of $100.000.

Capitalized at $90,000 Mongeau Rubber Co. Limited, have been incorporated at Montreal, Que., to manufacture iron, steel, copper breass, and other metal products.

The Vulcan Company, Limited, London, Ont., has been incorporated with a capital stock of two hundred and fifty thousand dollars to manufacture iron, steel, brass, copper, and other metal products.

Fire destroys foundry. The foundry owned by the Chicoutini Pulp Co., Chicoutini, Que., was recently burned with a loss of $50,000. It is the intention of the company to rebuild as soon as plans can be prepared for a modern structure.

The Sydney Foundry and Machine Works, Sydney, C. B., has received a crown grant of all the water areas fronting their properties on Sydney harbor and will proceed at once with the construction of wharves and slips on their newly acquired harbor properties.

The Enterprise Foundry Co., Sackville, N.B., are building a new foundry with a floor space of nine thousand, two hundred square feet. This addition will run in conjunction with their present plant. They manufacture stoves, ranges, furnaces and fireplace fittings.

The Malleable Castings Company, Smiths Falls, Ont. which had been closed down for a few weeks, re-opened their plant on November 30th with fifty men. This is only a portion of their regular staff, but the others will be taken on from week to week and it is hoped to soon be running to full capacity.

The Brantford plant of the Massey-Harris Co. which has been practically closed since harvest time has re-opened with about 30 per cent of their hands. The company had quite a number of binders and mowers left over from the last season and are not rushed but hope to be running full time in the near future.

Whiting Corporation, Harvey, Ill., Chicago Suburb, has purchased a controlling interest in the Grindle Fuel Equipment Co., manufacturers of Complete Powdered Coal Plants for use in connection with malleable furnaces, annealing ovens, steam boilers, billet heating and various other types of furnaces.

The Bowmanville Foundry Company, Bowmanville, Ont., have sold their recently abandoned plant to a knitting company and are now properly installed in their new works and report that they find business very much improved and still improving. Their new foundry has a floor space of 13,000 square feet.

The N. B. Prichard Manufacturing Plant at Sherbrooke, Quebec, owned by the Dominion Metal Company, is to be enlarged and new equipment installed. Plans are now under way for the erection of a three-story building. In addition to their regular line the company intend to manufacture high temperature fire cement, etc.

A correction: In the last issue we announced that Mr. A. E. Cambridge had gone to Montreal to take charge of the office and warehouse of the E. J. Woodison Company. This should have read that he had been transferred to the Montreal office to take charge of the Engineering end of the business.

The Welland Machine and Foundry Company, Welland, Ont, have sold their plant in that city to the Weeks Engineering Corporation, an American organization, who will proceed at once to install machinery for the manufacture of boiler plate and boiler tubes. Additional buildings will be erected in the spring, when more machinery will be installed.

Opens Malleable Department. The International Harvester Co., Hamilton, Ont., have resumed operations in their malleable iron foundry after a short shut down. The grey iron foundry and other departments of the works will be opened in a short time although the company is still in possession of some of their last year's stock.

Canadian Aluminum, according to a London, Eng., dispatch is underselling the German product in Great Britain, by two pence per pound. The Mercantile Guardian, after going the rounds of the world's markets, announces that in spite of the depreciation of the mark it took 16 1-2 pence English money to buy a pound of German aluminum while the Canadian product was quoted at 14 1-2 pence.

The Cockshutt Plow Company, Brantford, Ont., have again started operations, after their fall vacation. Only a small staff has been taken on for the present, but it is hoped that all the departments will be in operation in the near future. The company manufacture a line of farm implements, and farmers have been holding off, with the result that warehouses have not been emptied.

The Georgetown Foundry and Machinery Co., Georgetown, Ont., report a steady increase in business during the last two months. They are now contemplating the purchase of a wet cinder mill as they have concluded that it would save its cost several times over in reclaiming good iron and coke from the several hundred cubic yards of refuse which have accumulated during the past number of years.

Ottawa Metal Products have been organized at Ottawa, Ont., to manufacture the Vacuette Suction Sweeper, and have taken over the plant of the Ontario Specialties, Limited, of that city together with the assets and liabilities of said company. They operate a foundry for the production of brass, bronze, aluminum, lead and manganese castings, and also do plating and galvanizing.

The Chippawa Power Canal is practically completed and will be in operation before the end of the year. The last of the great shovels, the largest in the world, used in the excavation work, completed its task on Wednesday, Nov. 31. The work of lining the canal with concrete, which has been keeping pace with the excavating, but about two weeks in the rear, will be completed in a few days when the canal will be ready to receive the water, which will drive the largest dynamos which were ever built.

J. W. Cumming Mfg. Co., New Glasgow, N.S., have just completed their new steel foundry. This department of the business was begun in the early part of the present year doing a general or miscellaneous line fo electric melted steel castings. The results have been satisfactory to an extent sufficient to warrant the erection of a new and modern foundry building, thus adding one more to Canada's electric-furnace foundries.

Mr. A. D. Keene, Electric Furnace Engineer of the General Electric Company, Schenectady Works, is now connected with the Pittsburgh Electric Furnace Corporation as engineer on electric furnace designs and applications in the the steel and metal industries, and has

moved his residence from Schenectady to Pittsburgh. His joining the Lectromelt forces indicates a broadening out of that line, which has heretofore been confined to melting and refining furnaces for steel, iron and brass, bronze and ferro alloys.

The Grindle Fuel Equipment Co. has moved its offices to Harvey, Ill. and will continue its business under the same name. Whiting Corporation will manufacture all Grindle equipment.

"The following officers have been elected:

President	B. H. Whiting.
Sec. and Treas.	T. S. Hammond
V. P. and Gen. Mgr.	A. J. Grindle.

Board of Directors.

J. H. Whiting, B. H. Whiting, T. S. Hammond, A. J. Grindle, R. H. Bourne, N. S. Lawrence, A. H. McDougall."

BEAM DUST

In every foundry where red hot molds are "shook" out there is dust. This dust is carried upward with the burned air and gas which is lighter than the fresh air which takes its place. The very lightest and dustiest of it may find its way out through the ventilators but most of it just rises to a height in line with the ventilators or possibly a little lower, when the cool air from the outside, lessens power of the steam which is contained in the gas to sustain this extra weight and it settles down on all the beams and in fact on every projection. Most foundrymen, with their characteristic slovenliness, leave this dust lying from year to year to tumble off from every little vibration of the building and to the annoyance of the molder who happens to be working under it. Others who are more up-to-date and who whitewash the place occasionally will have a man go up there with a broom and sweep it off onto the sand heaps where it will mix in with the coarse molding sand and have an injurious effect, while others will go to the trouble of putting it into barrows and wheeling it out to the dump.

Now all of these are wrong. The proper thing to do is to carefully brush this up and put it into barrels and save it, and when it is desired to make a real superfine piece of fine light casting there is nothing to compare with this material for facing sand. It requires to be sifted and tempered quite a while ahead of time to be sure that it is thoroughly soaked, and it must be used as dry as possible, otherwise it is apt to blow. The trouble with allowing it to get mixed through the sand heap is that being fine it fills the space between the grains of coarse sand and closes the vents, and also the amount of water carried in ordinary sand is too much for this kind of sand. For match plates and delicately traced patterns it excels, as it makes a smooth clean face true to every detail. If analyzed it will be found to contain the small particles of molding sand, also plumbago from the facing as well as some of the smoke which is to all intents and purpose the same thing as lamp black, which is one of the best heat resting materials to be found, being almost pure carbon.

A RICH DEPOSIT OF CHINA CLAY FOUND IN CANADA

High grade china clay or kaolin has been located at St. Runi D'Amherst in the Province of Quebec and has been tested by the Mines Branch, Department of Mines, Ottawa, showing a very satisfactory fusing point of considerably over 3000 deg. Fah.

The Canadian China Clay Co., who own and operate the mine, have for some time been supplying the paper, paint and cotton industries with a high grade article. They have also shipped some to the foundries in a crude state with satisfactory results. So far they have not had the facilities for grinding the clay for foundry use, but during the last season they have devoted a lot of time and labor in developing the property and equipping for the business which they anticipate. What is designated as China clay is finer than the foundry trade calls for, but the coarser grades which are equally as refractory are ideal for foundry use. The company is already manufacturing and shipping fire bricks and are building a mill for grinding the fire clay preparatory to shipping to the foundries and other industries where furnace linings are required.

NOBODY CAN AFFORD TO LOAF

Loafing does not mean absolute idleness—hours, days or weeks in which a man does nothing at all. A man may loaf while apparently working, by doing things listlessly, sluggishly, carelessly or in a don't-care fashion. The loafer is the man who puts momentary ease in the place of definite and strenuous accomplishment; he is the man who works when he feels like it but who never has the courage and will-power to conquer his present feelings for the sake of future rewards. John Wanamaker, during the first eight years of his commercial life, did not miss one single day from business, was never late, and never allowed himself to be discouraged.

Very few men today are working fifty per cent of their capacity. If history teaches anything it is that those who loaf, lounge, or are lazy when they might work, are headed for poverty and obscurity. There is no case on record where opportunity has picked a young man out of the pool room to set him in a high position; I do not know an instance where Providence has rewarded indolence. Never before was life so rich in prizes of all kinds as it is today, but never was the law of labor more rigidly enforced in winning them. And nature is without mercy—it never forgets or forgives when a man wastes his time, his brain or his energy. The heaviest tax in the world is that which society exacts from the loafer—it takes everything that he has; it leaves him without a single satisfaction. Loafing is the costliest commodity on the market. No one can afford to buy it.

WHEN IT DOES NOT PAY TO RISE TOO FAR

It is irksome not to advance rapidly. It tries one's patience. It makes one sometimes feel discouraged. But the events of the last eighteen months have brought home to many that it is dangerous to rise too far, especially in abnormal times. What has happened in a great many concerns is this: During the boom period promotions were made pretty rapidly. Things moved so quickly and money was being made so easily that promotions and salary increases were not always scrutinized with care.

Then disaster came. Boards of directors ordered drastic retrenchment. In many instances outside experts were called in to recommend reorganization of forces. Their investigations revealed that certain men were drawing big salaries for doing comparatively little work and that these men often were not of calibre warranting the salaries received. When heads began to fall, the heads of such men were the first to drop. In a great many cases, their places were taken by assistants or others who had not basked in the favor of any higher-ups and who were doing a lot of work for relatively little money.

If a list could be compiled of the dismissals during the last year of men drawing salaries of from $10,000 to $50,000 a year, it would create a tremendous sensation.

During this same period not a few able, industrious, conscientious fellows have moved upwards to fill the places of those who rose too rapidly and too far. The law of compensation may often seem to us to operate heartbreakingly slowly, but it does operate. It is safer to be paid less than one is worth than more than one is worth. That's a thought worth keeping in mind.—Forbes Magazine.

NEW DEVICE FOR CRANE OPERATION

In the operation of large cranes used in building construction or for dock work it is generally necessary to have two men engaged, one working the controllers, and the other stationed at some convenient point to signal to the first. With the aid of a device invented in Great Britain it is possible to dispense with one of these men. The device consists of a portable electric controller which can be slung over a man's shoulder and can be supported by means of a long pointed leg. This controller is connected by means of a strong flexible cable with special controlled gear operating the crane motors. The user has merely to press certain buttons on the controller to make the crane go through all its usual evolutions. Thus the operator can stand at any point convenient for observation or he can walk about from one point to another so as to secure a complete supervision of the working of the crane. This invention should be of the greatest assistance in saving labor in docks and on construction work generally.

Some of the Economic Minerals of Canada

Some Figures of Production Taken From the "Preliminary Report on the Mineral Production of Canada During the Year 1920"

By WYATT MALCOLM

The following is the continuation of an article published in our last issue and covers a few of the more important minerals of Canada. In some minerals Canada leads the world for instance:—

Nickel

Canada supplies over three-quarters of the world's nickel. A small part of this comes from the Alexo mine, Dundonald township, northern Ontario, and from the ores of the Cobalt silver camp, but most of it comes from large deposits mined in Sudbury district, Ontario.

The ore of the Sudbury district consists of a mixture and chemical combination of sulphides of nickel, copper and iron, together with a certain amount of rock. Small quantities of platinum and palladium are recovered in the refining process.

The ore deposits are large bodies of irregular lenticular form extending to a considerable depth. At one mine, the Creighton, the shaft has been carried to a depth of 1,941 feet on an incline. The total production of ore from this mine alone to the end of 1919 was 8,874,780 tons and during the war period it exceeded 5,000 tons per day. The bodies of ore lie at or near the outer edge of a wide belt of igneous rock that outcrops in the form of an ellipse, 36 miles long and 16 miles wide. The igneous rock is conceived by most geologists to have forced its way as a thick sheet or sill between a series of sediments and underlying older rocks and to have sagged down in the centre so as to become boat-shaped. Subsequent erosion has removed much of the overlying rock, exposing the igneous sill in such a way that its edge now forms the large elliptical belt described above.

The discovery of the fact that the orebodies lie at or near the outer edge of the belt, that is, at what is really the bottom of the sill, has been of great service in prospecting—so much so that in 1917 by using this knowledge a very large body of ore was discovered in an area where the rocks are concealed by a mantle of surface deposits of great thickness.

The prominence given to the metal nickel during the war has given the impression to many that nickel is essentially a war mineral, and is useful only for the manufacture of armour plate, ordnance and projectiles. This is a misconception. Nickel is used for plating; it enters into the composition of alloys; and is used in the manufacture of steel that is employed for a great variety of industrial purposes such as rails for the terminal points of railways, bridges, automobiles and safes.

The construction of the Canadian Pacific railway led to the opening of the Sudbury mining camp. Mining has been carried on for about thirty-five years and there are known reserves of ore sufficient to last for decades at the normal rate of consumption. The following figures indicate the growth of the nickel mining industry in normal times and the effect of the war on production.

Year	Tons nickel produced	Value
1905	9,438	7,550,526
1910	18,635	11,181,310
1913	24,838	14,903,032
1914	22,759	13,655,381
1915	34,154	20,492,597
1916	41,479	29,035,497
1917	42,165	33,732,112
1918	46,254	37,002,917
1919	22,272	17,817,953
1920	30,568	24,454,597

Nickel deposits with geological associations similar to those of the Sudbury ores have recently been found on Maskwa river, southeastern Manitoba. The analyses of a number of samples taken at different points indicate that these deposits are worthy of careful examination.

Gold

Gold is one of the most important minerals produced in Canada, and in 1920 ranked second among the metallic minerals, nickel taking first place. The production for this year amounted to 766,912 ounces valued at $15,853,478. Of this, Ontario is credited with 564,959 ounces, British Columbia with 127,387 ounces, and Yukon with 72,140 ounces. A small amount comes from the provinces of Nova Scotia, Quebec and Manitoba.

Most of the gold mined in Ontario comes from the Porcupine and Kirkland Lake districts of northern Ontario. It occurs in quartz veins, irregular masses of quartz, and mineralized schist of Precambrian age; the Precambrian rocks comprise the oldest series of rocks exposed on the surface of the earth. Porcupine district includes the Hollinger mine, one of the most productive gold mines known. From the time operations were started on a small scale in the winter of 1909-1910 until January 1, 1921, the dividends paid by the Hollinger Consolidated Gold Mines, Ltd., amounted to $13,369,000; and from 650,205 tons of ore milled in 1920 this company produced 198,123 ounces of gold. Large reserves of ore have been developed and with the present improvement in the conditions for gold mining and an abundant supply of efficient labour there should be a great increase in the output.

In British Columbia gold is recovered from veins, and placers, and in the refining of copper derived from ores mined from enormous low-grade deposits. From Cariboo district in central British Columbia, where the mineral occurs in pre-Glacial gravels, nearly $45,000,000 in gold is officially reported to have been recovered, and it is probable the output was much greater.

In Yukon were found the rich Klondike placers that created such intense excitement nearly twenty-five years ago, and led to one of the greatest rushes of prospectors that gold camps have ever experienced. Yukon has produced $163,729,000 in gold, the maximum production being reached in 1900 when it amounted to $22,275,000. Placer mining is still carried on, but the Klondike is no longer a poor man's diggings. Most of the gold is now recovered by means of powerful dredges, a method that involves a very considerable capital expenditure.

Gold mining on a moderate scale has been carried on in Nova Scotia for sixty years. The gold occurs in quartz veins of saddle shape, lying in the planes of closely folded slates and quartzites. The veins are narrow, but the ease with which they are mined, and the richness of the ore chutes have rendered the operations profitable.

Silver

Most of the silver produced in Canada comes from the provinces of Ontario and British Columbia. Out of a total production of 12,793,541 ounces in 1920, Ontario is credited with 9,542,466 ounces and British Columbia with 3,158,707 ounces.

Nearly the whole of the production from Ontario comes from Cobalt, one of the best known silver camps of the world. Silver was discovered there in 1903 by men employed in construction work on the Timiskaming and Northern Ontario railway which was then being pushed northward through a non-arable rocky section to the fertile "clay belt" in the northern part of the province. Since shipments were first made in 1904 the camp has produced over 300,000,000 ounces of silver, reaching the maximum in 1911 when it was 31,039,104 ounces.

The ore consists of native silver associated with arsenides of cobalt and nickel, with a gangue of calcite. It occurs in veins a few inches in width traversing Precambrian conglomerates, greenstones and diabase. The minerals are thought by geologists to have had their origin in the diabase that takes the form of a sill intruded in the conglomerates and greenstones. The ores are high grade and a great deal of ore has been mined running several thousand ounces of silver per ton. In the early days of the camp many spectacular showings were revealed by the removal of drift from the surface of the veins. which had been smoothed and polished by glacial action and protected by the mantle of drift from subsequent oxidation.

In the refining of the ores the metals nickel and cobalt and their oxides are recovered; arsenic is another product.

The silver of British Columbia is derived mainly from argentiferous galena, the most important mining districts being Slocan and Skeena. New silver producing areas on Alice Arm and Salmon river, in northwestern British Columbia, are adding considerably to the silver production of the province.

Much attention has been directed, recently, to the occurrence of rich argentiferous galena deposits that are now being mined in Mayo district, Yukon.

(Continued in next issue)

HONORS FOR BERTRAM D. DEAN

Hamilton, Ont.—W. H. Dean, for over forty years a traveler for the hardware wholesale firm of Wood, Alexander & James, is much elated over the success abroad of his son Bertram D. Dean, a Seattle engineer, who has been selected to construct a very important $500,000 bridge spanning the Columbia river.

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No. 206 Plumbago

An Ideal General Purpose Lead

Our No. 206 Plumbago may be used wet and makes a perfect wash for dry sand molds.

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For Heaviest Green Sand Castings

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You patronize home industry when you purchase **Hamilton** Facings and supplies. And it is well to remember that when you purchase our lines you get quality and prices that are second to none. You can prove this to your satisfaction with a trial order.

When you are in need of Soft Brushes, Hard Brushes, Scratch Brushes, Chaplets, Flasks, Rammers, Ridges, Bellows or any other Supplies send to us. Prompt service and quality products assured.

The Hamilton Facing Mill Co., Limited

Head Office and Mills

Hamilton, Ontario, Canada

PLATING AND POLISHING DEPARTMENT

Question.—One of the lady employees of our plating department has been washing her face in hot water taken from the tank in which the nickel work is washed after plating. Now she has sore eyes which are all inflamed and continue to discharge and are very painful. We believe it is caused through getting this water in her eyes. We have searched all the papers which would be likely to treat on this, but with little effect. In one of your publications of some years ago we find a little bit of information but it does not seem to be just the thing. Can you advise us regarding the treatment?

Answer.—We assume the water or solution used for washing the plated work is rather strongly alkaline and contaminated by presence of more or less organic matter introduced by means of buffing compound. The actual cause of the painful condition can only be ascertained by careful diagnosis of the case by a conscientious physician or oculist. With the few details from which we have to form an opinion, we would suggest the following: Dissolve boracic acid in hot water until a saturated solution is obtained. Allow to cool. Apply the solution to the eye by means of an eye cup. The eye should be opened and closed repeatedly during the application to permit contact with entire surface of eyeball and inner lining of eyelids. This treatment should be given hourly throughout the day. At bedtime wash the eye thoroughly in same manner with clean, warm water, and while moist apply to the lids a 2 per cent. ointment of cocaine hydrochloride and white vaseline. Now moisten a piece of lint with hot water and cover the eye. Bind the lint on by means of a bandage. This treatment must be persistently repeated and the eye must not be touched by the fingers or soiled clothes, if a rapid and satisfactory return of normal conditions is expected. The employees in the plating department should be provided with suitable washing facilities, and be instructed to use nothing but soap and clean water on the face. Danger lurks in every pail, tank, pan, crock, or other vessel used in the processes of cleaning, plating or coloring metals, if such containers are employed as wash basins. Furthermore, any solution containing strong cleaning, plating or coloring chemicals is absolutely unsafe when habitually employed as a face wash even though the solution be very dilute. "Safety First."

Question—Will you please let me know which is the best material to use for making a silver solution. Chloride of silver or cyanide of silver?

Answer—Cyanide of silver is the better material. It is of special value when heavy deposits are required and is used by all manufacturers of high grade flat and hollow ware. It is more expensive than the silver chloride. For ordinary silver-plating the chloride will give equally good results as the cyanide.

Question—We have several thousand sulky wheel hub cases to nickel-plate. In buffing these cases we find a large percentage of them spoiled by the nickel peeling on the run which holds the spokes. In some cases, the nickel cracks off in flakes and in other cases the nickel curls off in strips. We have used extra care in cleaning, but the trouble continues. Please advise us as to method which will correct the difficulty. I may add. we nickel-plate directly on the steel.

Answer—As you have neglected to mention particulars respecting actual working conditions in your plant, we are compelled to reply to your question in a rather general manner, that is, we can only surmise that certain conditions exist and advise you accordingly. There are several conditions which would be favorable to peeling on the hub case run. Too high voltage, solution temperature too low, poor conductivity of solution, alkaline solution, low metal strength, unclean rim. These are some of the more probable causes; of these we are inclined to believe poor conductivity and alkalinity, or poor conductivity and low temperature are the causes which you should look to first. To increase the conductivity, add to each gallon of the bath 2 oz. of magnesium sulphate and 2 to 3 oz. of nickel sulphate. Dissolve these chemicals in a portion of the solution which may be placed in a clean whiskey or wine barrel or a stoneware crock. Then add to the solution in plating tank, stir the whole thoroughly and allow to settle before using. Use a long stem testing thermometer to obtain correct temperature of solution near bottom of the tank. A nickel solution operated at a temperature below 60 degrees Fah. is liable to be very "tricky". If you cannot maintain the solution at higher temperature during nights and week-ends, you may improve your working conditions by removing about one-fourth the volume of the bath to clean barrel and heat the solution by injecting steam, then replace in plating tank by pouring through a fine mesh sieve or cheese cloth strainer to avoid disturbing slime at bottom of the tank. Increase the conductivity of the solution and the proper ampere current density can be obtained without increasing the voltage. In fact, you will probably be able to use a higher current density at a lower voltage than you now employ, thereby reducing the tendency to brittle deposits even though the nickel solution be a little unbalanced respecting acidity. Inspect the anode surface, see that each anode has good contact with positive tank rod, and that each anode is disintegrating properly. If you find that the nickel solution requires frequent additions of nickel salts to maintain a certain density (Beaume), you may conclude that the anodes are not feeding the solution properly, possibly because you have an insufficient number of anodes in the solution, or they are of inferior quality. Now remember the nickel content of the anode may be high or up to your specifications, and as a nickel casting it may be absolutely perfect, but, as an anode to be used in an electrolytic process such as electro-nickel plating, it may prove to be practically useless. Why? Because it will not disintegrate properly in any nickel solution. The anode may break up and wear away, but the structure is of such nature as to make it practically impossible to dissolve the anode. It therefore gradually falls to the bottom of the tank and forms small mounds of metal beneath each anode, and it is finally shoveled out as waste, yet, this material often contains as high as 56 per cent. nickel in the form or shreds. After giving the above details due consideration it will be well to again take notice of your cleaning operations, simplify them as much as possible, but, be sure the surface of the work is chemically clean when placed in the nickel solution. A dilute hydrofluoric acid dip is a splendid final safeguard for steel. Keep the surface of the final acid dip free from slightest film of scum.

Question—My helper added fifteen pounds of nickel carbonate to a 150-gallon cyanide copper solution, mistaking the nickel carbonate for copper carbonate. The deposit obtained after the addition was of a greyish tone and nickel deposits which were obtained on the work, subsequent to coppering in above solution, withstood the buffing operation, but proved non-adherent shortly after being subjected to ordinary wear by purchasers of the completed product. In each case, the nickel separated from the copper and the exposed copper was a dull, dirty grey color. We have ceased to use the solution and will await your advice respecting a possible method of saving the solution by some process which will remove the nickel or render it harmless to copper coatings. The solution is used hot with a current of about 5 volts.

Answer—Do not add anything to the copper solution, simply heat it as usual and suspend a bunch of small wires in the solution, turn on all the current possible and allow to plate in this manner

(Continued on page 48)

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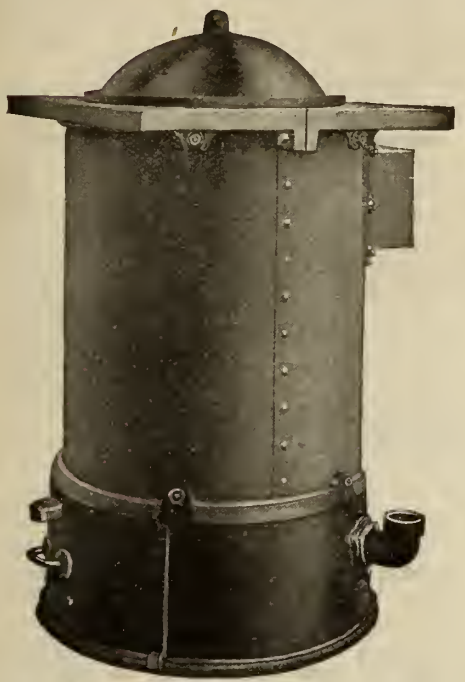
Before placing your order get our quotations—we carry the most modern labor-saving brass foundry equipment on the market.



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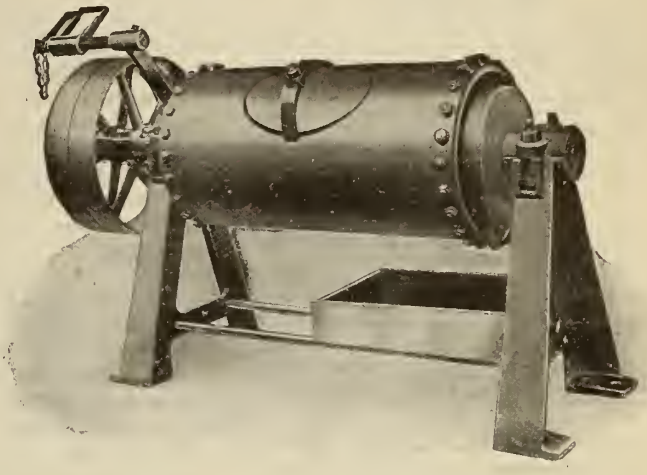

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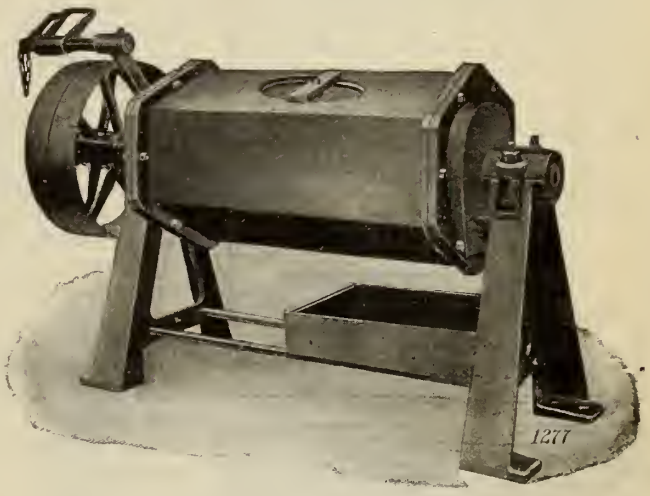

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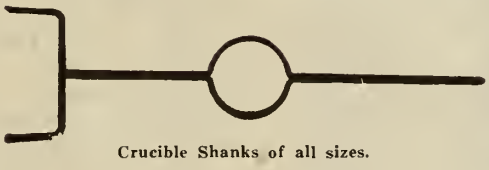

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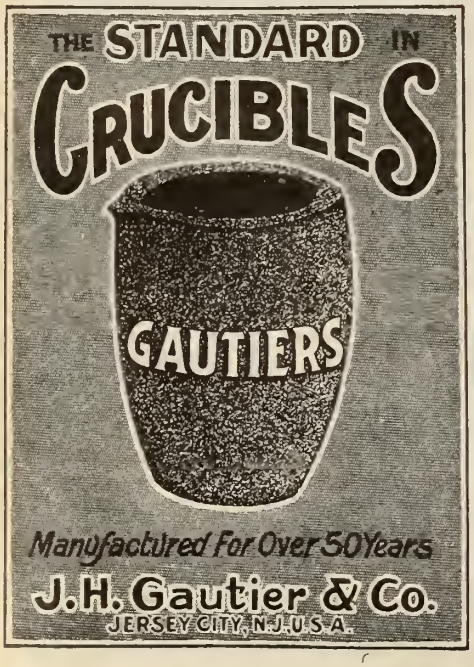

PLATING AND POLISHING

Continued from page 46

for at least three or four days. If the anodes coat over with dark oxide do not interfere with them as it is not necessary to get a copper deposit, you require a condition which will tend to permit the removal of the nickel from the solution, in doing this as here suggested you will deplete the copper content of the solution to some extent but not seriously. After three or four days' operation as above described, add enough sodium cyanide to clean the anodes and proceed to plate the bundle of wires as before, note carefully the shade of deposit obtained with varying current densities at this time and if the clean pink tone characteristic of pure copper is not obtained, continue the electrolyzing treatment for a day or so longer and test again as before. The nickel will eventually be removed sufficiently to permit the regular use of the solution for general purposes as originally intended. If the copper solution contained caustics it would alter the results, the above remedy is intended for copper solutions prepared and maintained without introduction of caustics. If your product is of a nature which encounters exceptionally frictional wear in ordinary use, we would advise prolonged electrolytic treatment before using same for plating purposes. Build up the metal strength with copper cyanide and there will be no excuse for anyone mistaking nickel carbonate for the proper copper salt when replenishing the solution.

Question—I have constructed a simple rotating plating machine similar in design to those sold by supply firms, the apparatus works very satisfactorily as regards deposits, but I notice that the current at the ordinary nickel tanks is considerably weaker. I have no means of measuring the current and am at a loss to know what to do as the machine has proven a great help in handling small pieces which were formerly plated in trays. Kindly inform me respecting the amount of current usually required to operate a plating machine of the rotating cylinder type.

Answer—The average mechanical plating machine of the rotating type operating in a nickel solution which contains approximately four ounces of nickel per gallon, the cylinder containing a charge of steel work which fills from one-third to one-half the cylinder and connected to a five-volt circuit, will usually consume from fifty to eighty amperes of current. If you are not using the entire output of your generator elsewhere or very close to it, the addition of the machine to the circuit should not make a noticeable difference at the still tanks, possibly you have neglected the generator and it is not producing as much current as it otherwise would, or there may be a leakage or ground in the circuit, perhaps the generator is actually over-loaded. Ascertain the real cause by using a testing ammeter which may be obtained from the nearest electrical supply house, correct the cause and then procure a voltmeter and an ammeter and cease working under prehistoric conditions. You will not progress or even keep up with the present trend of plating processes unless you adopt modern improvements more liberally. These instruments are not expensive and will solve many problems for you if you study their uses and apply horse-sense in the application of your practical knowledge.

Question—We nickel-plate small wire pins one-eight inch diameter by three inches long. These pins have a head on one end and are suspended in perforated pieces of brass while being plated. Recently the lower ends of the pins have acquired a tree-like formation of nickel during the one-hour treatment in nickel tank and the removal of this excess metal often results in large quantities of scrap pins. The condition is becoming more serious every day. Kindly advise us of cause and remedy at earliest convenient date.

Answer—Filter the nickel solution, clean the anodes, replace solution and anodes in tank and test the solution for acidity and metal. You will probably find it deficient in both. Add nickel sulphate to restore normal metal strength and if the solution is still too near neutral point add sulphuric acid until liturnes blue is quite perceptibly changed, add acid occasionally to maintain good working condition and if further difficulty is experienced of same nature, increase the conductivity of the solution by adding either magnesium sulphate or sodium chloride, say, two ounces per gallon. We do not believe you will experience any difficulty after cleaning and replenishing the bath.

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A new line of grinding machines has recently been placed on the market by the J. G. Blount Co., Everett, Mass. These machines are driven by alternating current motors of ½, 1 and 2 horsepower. The half horsepower machines have 8 in. x 1 in. wheels; the one horsepower machines, 10 in. x 1½ in. wheels; and the two horsepower machines, 12 in. x 1½ in. wheels. These machines are all equipped with S. K. F. ball bearings contained in dust proof housings. The spindles are high carbon steel and are ground to size. The wheel flanges are machined all over, and the inner flanges are pressed to the shoulder on the spindle. The tool tray and water pot are bolted to the column. They are separate and detachable. The tool rests are in one piece and adjustable. Each machine is equipped with one coarse and one fine grinding wheel unless otherwise specified. The machines are driven by Westinghouse motors equipped with starting switches of the textile snap type.

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(2) Masques of Ottawa—"Domino"
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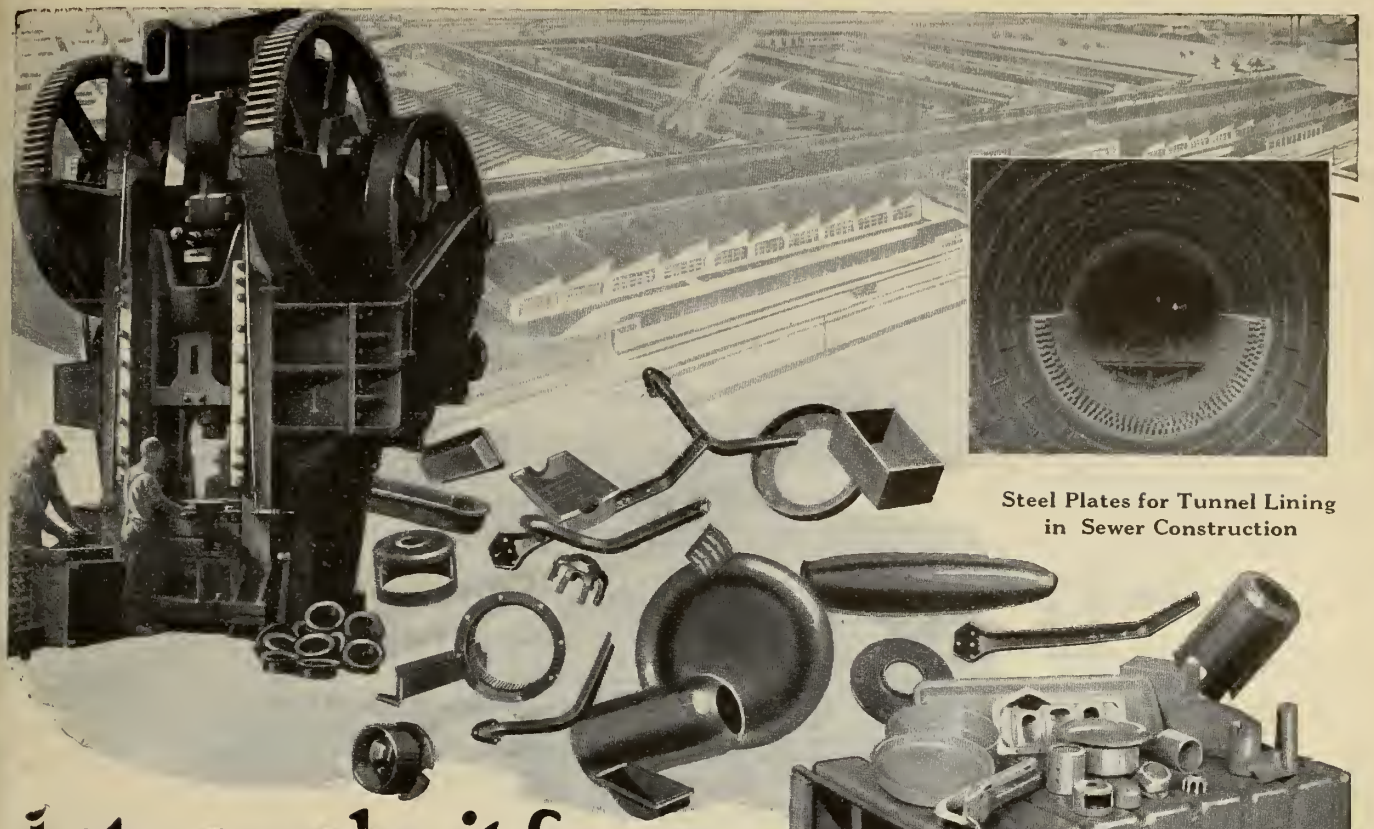

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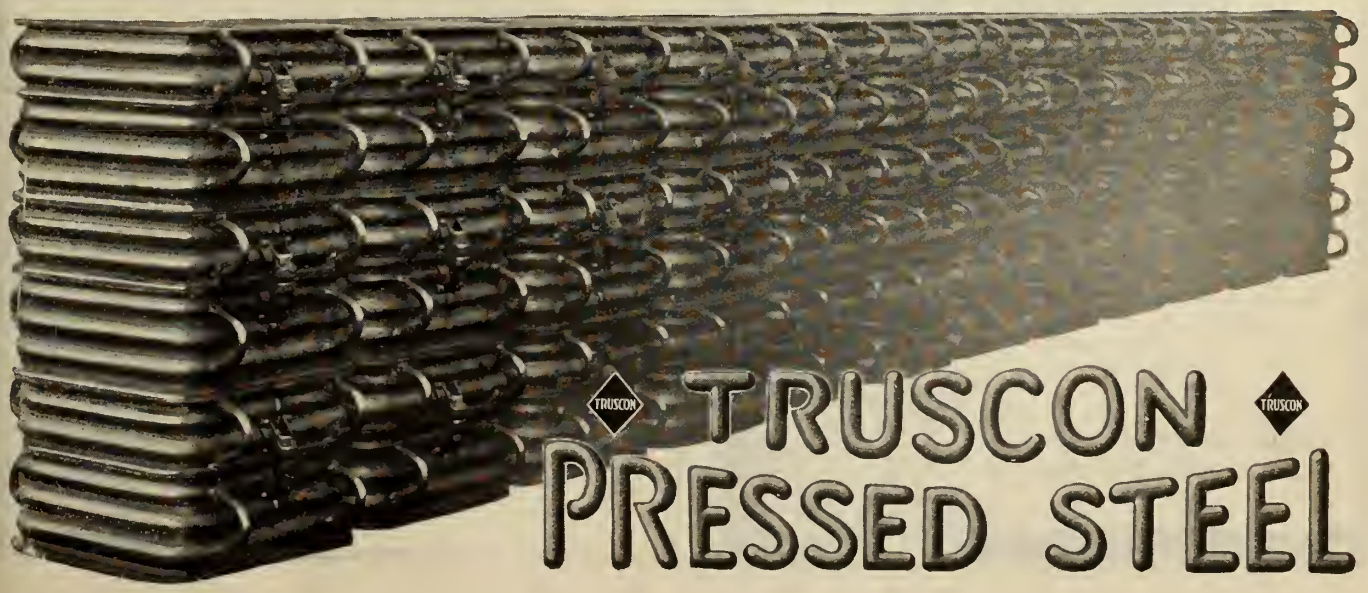

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A. C. Leslie & Co., Ltd., Montreal, Quebec.

FERRO-SILICON
A. C. Leslie & Co., Ltd., Montreal, Quebec.

FIRE BRICK
Bailey & Bell Firebrick Co., Toronto, Ont.

FLASKS
I. Johnson & Son. Ltd., Toronto.

FLASKS, SNAP
American Foundry Equipment Co., New York City.

Directory of Foundry Supply Houses

The Buyers' Directory of Canadian Foundryman was originally intended to contain information regarding lines in the production of which the advertisers actually specialized. We now carry the advertising of leading supply houses, some of whom represent scores of manufacturers, in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the supply houses so we recommend that for all general requirements our subscribers communicate with the supply houses listed below:

The Dominion Foundry Supply Co., Limited, Montreal, Toronto and Winnipeg.

The Hamilton Facing Mill Co., Limited, Hamilton, Ont.

George W. Kyle & Co., Inc., New York, U. S. A.

Frederic B. Stevens, Windsor, Ont.

The E. J. Woodison Company, Limited, Toronto, Ontario; Montreal, Que.

FLASKS, STEEL
American Foundry Equipment Co., New York City.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Trussed Concrete Steel Co., Walkerville, Ont.

FOUNDRY ENGINEERS
Charles C. Kawin, Chicago, Ill.
H M. Lane Co., Detroit, Mich.
McLain's System Inc., Milwaukee, Wis.

FURNACES, OIL
Hawley Down Draft Furnace, Easton, Pa.
Monarch Engineering Mfg. Co., Baltimore, Md.

FURNACES, GAS
Monarch Engineering Mfg. Co., Baltimore, Md.

FURNACES COKE
Monarch Engineering Mfg. Co., Baltimore, Md.

FURNACES ELECTRIC
Volta Mfg. Co., Welland, Ont.

GRINDERS, PORTABLE
A. W. Sainsbury, Ltd.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.

GRINDERS, SWINGING
A.W Sainsbury Lt., Sheffield, England.

HEATERS
E. J. Woodison & Co., Toronto,

HEATING SUPPLIES
Crane Limited, Montreal, Que.

HOSE COUPLINGS
Cleveland Pneumatic Tool Co., Cleveland, Ohio.

INDUSTRIAL ENGINEERS
H M. Lane Co., Detroit, Mich.

KAOLIN
Whitehead Bros., Buffalo N. Y.

LADLES
Damp Bros., Mfg. Co., Toronto, Ont.

LADLE SHANKS
Damp Bros., Mfg. Co., Toronto, Ont.

MAGNETS
Dings Magnetic Separator Co., Milwaukee, Wis.

MAGNETIC SEPARATORS
Dings Magnetic Separator Co., Milwaukee, Wis.

MALLETS
I. Johnson & Son, Ltd., Toronto.

METALLURGISTS
McLain's System Inc , Milwaukee, Wis.
Charles C. Kawin, Chicago, Ill.

METAL PATTERNS
Bryant Pattern Works, Windsor, Ont.
Hamilton Pattern Wks., Toronto, Ont.
I. Johnson & Son, Ltd., Toronto.

MOLDING MACHINES
American Foundry Equipment Co., New York City.
Benson & Patterson, Stamford, Ont.
Grimes Molding Machine Co , Detroit, Michigan.
Herman Pneumatic Tool Co., Pittsburgh, Pa.
Osborn Mfg. Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
W. H. Nicholls, Brooklyn, N. Y.

MOLDING SANDS
Whitehead Bros., Buffalo N. Y.
A. MacMillan, St. Catharines, Ont.
Benson & Patterson, Stamford, Ont.
Brockville Molding Sand Co., Brockville, Ontario.
Geo. F. Pettinos, Philadelphia, Pa.
Venango Sand Co., Franklyn, Pa.

OXYGEN
Dominion Oxygen Co., Toronto, Ont

PATTERN MAKERS
Bryant Pattern Works, Windsor, Ont.
Hamilton Pattern Wks, Toronto, Ont
I. Johnson & Son, Ltd., Toronto.

PIG IRON
A. C. Leslie & Co., Ltd., Montreal.
Steel Co., of Canada, Hamilton, Ont.

PIPE FITTINGS
Crane Limited, Montreal, Que

PLUMBING SUPPLIES
Crane Limited, Montreal, Que

PNEUMATIC TOOLS
Cleveand Pneumatic Tool Co., Cleveland, Ohio.

PULLEYS
Dings Magnetic Separator Co., Milwaukee. Wis.

RIDDLES
Great Western Mfg. Co., Leavenworth, Kansas.
The Preston Woodworking Machine Co., Preston, Ont.

SAND
Benson & Patterson, Stamford, Ont.
Brockville Molding Sand Co., Brockville, Ontario.
Dick Sand Co., Franklin, Pa.
George F. Pettinos, Philadelphia, Pa.
Venango Sand Co., Franklyn, Pa.
Whitehead Bros., Buffalo N. Y.

SAND CUTTING MACHINES
American Foundry Equipment Co., New York City.

SAND MIXERS
Frost Mfg. Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.

SAND SIFTERS
Great Western Mfg. Co., Leavenworth, Kansas.
National Engineering Co.
The Preston Woodworking Machine Co., Preston, Ont.

SAND BLAST MACHINERY
American Foundry Equipment Co., New York City.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co., Cleveland, Ohio.

SAND MULLERS
Frost Mfg. Co., Chicago, Ill.
National Engineering Co., Chicago, Ill

SAND BLAST ABRASIVES
George F. Pettinos, Philadelphia, Pa.
Globe Steel Company, Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

SAND RAMMERS
Cleveand Pneumatic Tool Co., Cleveland, Ohio.

SANITARY EQUIPMENT
Crane Limited, Montreal, Que.

SNAP FLASKS
American Foundry Equipment Co., New York City.
Damp Bros., Mfg. Co., Toronto, Ont.
Diamond Clamp & Flask Co., Richmond, Indiana.
I. Johnson & Son, Ltd., Toronto.

SNAP FLASK JACKETS
Damp Bros., Mfg. Co.. Toronto, Ont.

STEEL BANDS
Damp Bros., Mfg. Co., Toronto, Ont.

TUMBLING BARRELS
N. Slater Company, Hamilton, Ont.
R. MacDougall Co., Galt, Ont.
W. W. Sly Mfg. Co., Cleveland, Ohio.

VALVES
Crane Limited, Montreal, Que.
Cleveand Pneumatic Tool Co., Cleveland, Ohio.

VENT WAX
United Compound Co., Buffalo, N. Y.

WASH ROOM FIXTURES
Crane Limited, Montreal, Que.

WELDING AND CUTTING SUPPLIES
Dominion Oxygen Co., Toronto, Ont.

WHEEL BARROWS
Sterling Wheelbarrow Co., Milwaukee, Wis.

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HARDLY a week passes that Canadian Foundryman does not receive copies of this paper returned by the postal authorities because of the change in firm names or the address of some whose names are on the mailing list. Sometimes complaints reach us of the non-delivery of mail matter. It is not till the receipt of such complaints or the return of the paper, as the case may be, that we obtain any knowledge of the changes or removals of persons or firms. The adoption of the co-operative spirit on your part by notifying changes would make things a good deal more pleasant for both parties. The MacLean Publishing Co. want their mailing list to be in such shape that they will be able to render the perfect service to their subscribers. There is a lot of valuable trade matter mailed by this company and if you don't receive it—well, the fault is entirely yours.

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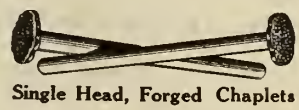

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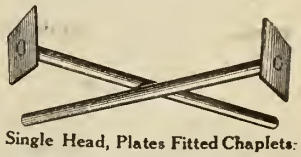

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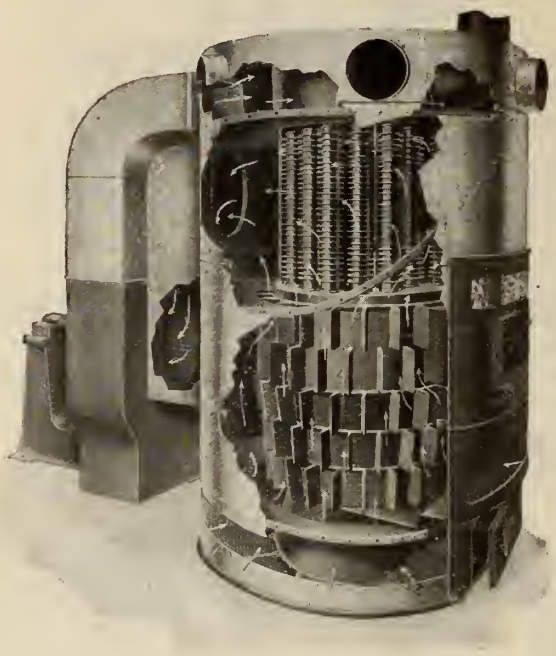

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